December 1983

An independent magazine published by ECC Publications

sinclair user

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Issue No 21

BUMPER CHRISTMAS ISSUE

New business software survey

Software for Christmas stockings

Special festive competition

Interface two reviewed

Cambridge award winners announced



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All games 16K unless otherwise stated

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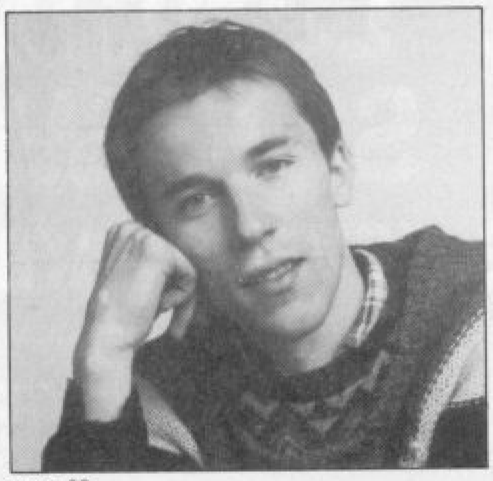
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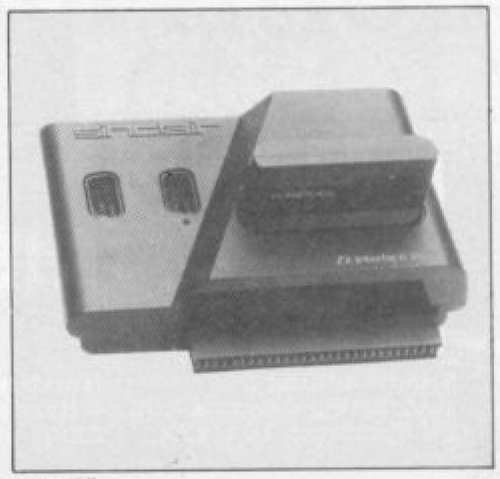
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All departments
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If you would like to contribute to any of the Sinclair User group of publications please send programs, articles or ideas for hardware projects to:
Sinclair User and Programs,
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196-200 Balls Pond,
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Programs should be on cassette and articles should be typed. We cannot undertake to return them unless a stamped-addressed envelope is included.
We pay £10 for the copyright of each program published and £50 per 1,000 words for each article used.

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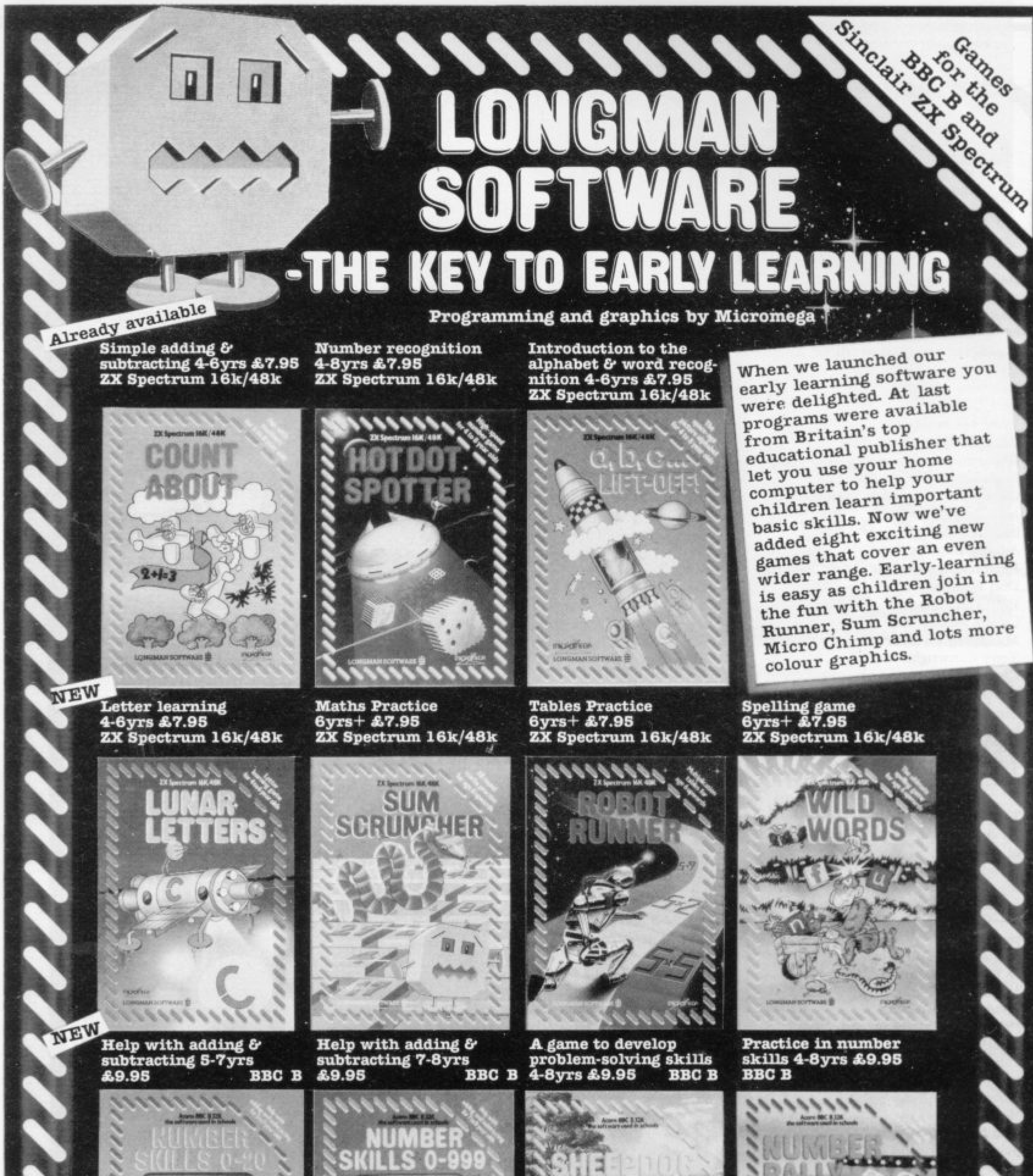
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NEXT MONTH

We begin a regular educational series and we meet a vicar who uses his Spectrum in his parish.


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LONGMAN SOFTWARE
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LONGMAN SOFTWARE

Coping with competition

IN LITTLE MORE than 18 months, home computing has grown from an obscure hobby, sparked by the appearance of Sir Clive Sinclair's revolutionary inexpensive computers, to a multi-million pound business with an expansion rate which shows no signs of slowing.

This Christmas, you can walk into any number of high street stores, from W H Smith to Woolworths and Boots, and buy a ZX-81 or a Spectrum as easily as a desk diary or a bottle of after-shave lotion. Nor does a small band of beleaguered enthusiasts any longer have to swop precious tapes, or write to little-known programmers and trek to distant specialised shops to obtain new ones. Smartly-packaged software is available in many more outlets than the computers, as is a bewildering and ever-increasing number of computer-orientated magazines—more than 70 at last count.

It is estimated that by the end of the year there will be one million computers in the nation's living rooms and schools. In spite of some fierce competition from rival makes at the cheap end of the market—the Oric One, the Vic-20 and no doubt soon the Electron chief among them—the Spectrum is holding its own and still leads the field in popularity. At this time last year, Sinclair Research sold some 75,000 computers by mail order alone. This year, retailers' orders for the Spectrum have already exceeded 200,000 and dealers are reporting difficulties in satisfying the demand for the machine.

The long-awaited Microdrive is expected to give the popularity of the Spectrum an additional boost, once the familiar Sinclair supply problem has been overcome. More than a month after its appearance, the Microdrive was still being sold by mail order to people who bought their Spectrums by mail order, according to the sequence in which they did so. Sinclair Research says that it is still far from reaching the end of the list and that it will be several months before the Microdrive is available over the counter.

Even when it is, there is no guarantee that the Microdrive will enjoy the success predicted for it. At £5, the cartridges are expensive compared to floppy discs, which provide slightly more memory, and so far software manufacturers have not been falling over themselves in their eagerness to produce their wares in Microdrive cartridge form.

Meanwhile, Sinclair Research is looking beyond the present healthy state of the Spectrum. A recent appearance at the SICOB computer show in Paris heralds a push into the European market. Sinclair Research admits that it has been largely overtaken by the Oric in European sales and problems of TV compatibility are another disadvantage—the Spectrum will be sold in France with an adaptor. Nevertheless, with computer sales in Britain at least a year ahead of those in other European countries, Sinclair Research is confident that there is sufficient scope for expansion overseas to make a concerted marketing effort worthwhile.

Rightly or wrongly, Sinclair Research is also planning to extend its range. The next Sinclair machine is likely to be an upmarket version, which incorporates flat-screen TV technology as well as a built-in drive, and is aimed at what has been identified as the growth area of the future—the top end of the home market and the lower end of the business market. Whether that area will provide richer pickings than the Spectrum has enjoyed so far remains to be seen.

There is little doubt at the moment that games are the fuel to power microcomputer success. The recently-launched Interface Two, with its joystick port and easy-to-load but expensive cartridges, turns the Spectrum into a streamlined games machine. At the same time, competition between software manufacturers is becoming as fierce as the micro war.

In the last few months there have been signs that the smaller software makers are suffering at the hands of bigger companies. Some have fallen from the race altogether; others are running hard to stay on the same spot, while firms like Melbourne House and the record company K-Tel are seeking to expand their activities by absorbing less viable software producers.

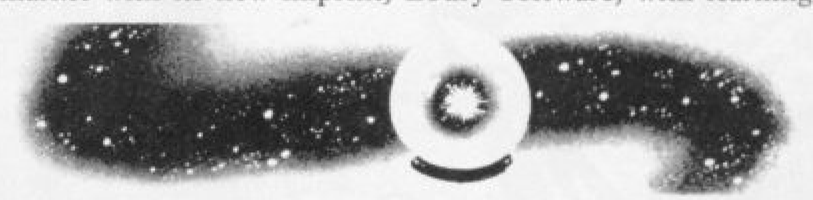
Entertaining—and even useful in terms of their appeal in helping to familiarise us all with the world of computers—though games might be, there is a danger that in time the seemingly endless possibilities of sound, movement, colour and graphics will be exhausted, along with the mind-stretching capabilities of adventure games. So far, the micro has meant an extension of leisure activities rather than the genuine change in our lives it was widely expected to produce.

In case the games bubble bursts, as it seems to have done in the video market, it is essential to back the spread of micros with a solid range of worthwhile educational and business software.

Sinclair Research is obviously aware of the problem and has already introduced educational cassettes to help the Spectrum on its way into the classroom; and the Interface One, with its networking capability, makes the Spectrum particularly useful as a teaching aid. Most are simple question-and-answer games but it is a start. Chalksoft, LCL, Scisoft, Hestacrest and others are also producing educational and business packages to support their games ranges.

Perhaps a more encouraging trend is the fact that respected publishers such as Heinemann and Longmans, both with long-established educational book lists, are entering the electronic publishing scene with software aimed at very young children learning at home, as well as at teachers using computers as a classroom aid.

The National Magazine Co, publisher of *Good Housekeeping* and *Cosmopolitan*, is also looking towards the pre-school market with its new imprint, Ebury Software, with learning



packages which educational advisers have helped prepare for three-to-six-year-olds.

Competition, and the publishing experience of the new entrants to the software market, can only be good for the quality of educational programs, which everyone agrees have so far been lacking in distinction. It is to be hoped that a different approach will help to identify the ways in which the micro can make a genuine contribution to education and enlarge horizons other than those of outer space.

In the meantime, it remains only for us at *Sinclair User* to wish you all a colourful, action-packed, entertaining and exciting Christmas. Once again, we repeat out pledge to bring you throughout the year ahead all the information you need to enjoy and benefit from your Sinclair computer.


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Melbourne House

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This month we also offer free programs for the most outstanding contribution to the Club

THE SPECIAL OFFER for Sinclair User Club members this month is a dK'tronics keyboard for either the ZX-81 or Spectrum. The keyboard has 52 keys and the computer fits neatly inside it. Any add-ons can be connected to the back.

There is a 15 percent discount on the keyboard, so Club members pay only £38.25, including post and packaging. When ordering, remember to specify whether you want ZX-81 or Spectrum version.

There is also a 20 percent discount on the range of software below.

From next month the Sinclair User Club will award £30 worth of free software to the member who in the Club's opinion has made the biggest contribution to the Club. It may take the form of ideas, suggestions or software contributions. It is in addition to our normal fee for software contributions.

We would like to congratulate one of our members, John Lawrence, who has been fortunate enough to obtain a university place specialising in his favourite subject — we bet you can guess the subject. His first machine was a ZX-81. He later upgraded to a 48K Spectrum. We all wish him the best of luck in his future studies.

Will all members please make sure that they include their membership cards with any orders for special offers, as some members are omitting to do so which can cause their orders to be delayed.

When the Sinclair User Club was asked to help with an autumn bazaar in St Albans we were pleased to be able to give support.

As the managing editor of *Sinclair User,* Nigel Clark, lives in the Hertfordshire city, he went with Spectrum and television set to provide a stall offering the opportunity to play computer games at 10 pence per attempt.

The computer looked out-of-place among the home-made preserves, the jumble and tombola stalls, but once people overcame their surprise it proved to be a successful fund-raiser.

"I was very encouraged by the first venture in helping organisations in their fund-raising," said Clark. "Although it was not as busy as I expected that was possibly as at the moment it is not the thing which you expect at the traditional bazaar."

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These offers are available only to members of the club. Anyone wishing to join should include a membership form with their application.

MEMBERSHIP FORM

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Sinclair User Club

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Basildon: Roundacre Microcomputer Users' Club. J Hazell, Basildon 285119/416333. Meetings every Wednesday 7.30 to 10.30pm.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Crewe and Nantwich Computer Users' Club: J E A Symondson, 46 London Road, Stapeley, Nantwich, Cheshire CW5 7JL.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX Club: Meetings every Wednesday 7pm at Youth Activities Centre. Belmont Road, Liverpool 6. Details from Keith Archer, 031-236 6109 (daytime).

Manchester Sinclair Users' Club: Meets every Wednesday, 7.30pm, at Longsight Library, 519 Stockport Road, Longsight — 061-225 6997 or 061 445 6316.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80–81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Nottingham ZX Spectrum Club: Would like to hear from new members. D Beattie and P Riley, 53 Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: South Yorkshire Personal Computing Group. Enquiries to R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

St Albans: Bi-monthly meetings and a magazine. Details from Adam Slater, 40 Watford Road, St Albans, Herts AL1 2HA. Telephone: 0727 54176.

Stratford-on-Avon ZX Users' Group: Chris Parry, 16 Sackville Close, Stratford-on-Avon, Warwickshire.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Austria: ZX User Club, Thomas Christian, c/o Wissenschaft Forscht e. V., Postfach 141, A1190 Vienna. Meets every first Friday of the month. Telephone 0222-44 32 050 for details.

Belgium: ASBL BDMA Belgium National Sinclair Club; P Glenisson, Rue De l'Epeestraat, 14, 1200 Bruxelles.

Belgium, France and Luxembourg: Club Sinclair, Raymong Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468).
Belgian User Group for Sinclair owners (BUGS); Op de Beeck, Patrick, Drabstraat 144, 2510 Mortsel.
Micro-Europe Club; R Betz, Chemin du Moulin, B1328, Ohain, Belgium. Telephone: CCP 000 0846556–37.

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.
ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.
J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jencyzyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Italy: Sinclair Club, Vie Molimo Veccho so/F, 40026 Imola, Italy.
Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80–81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.
Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

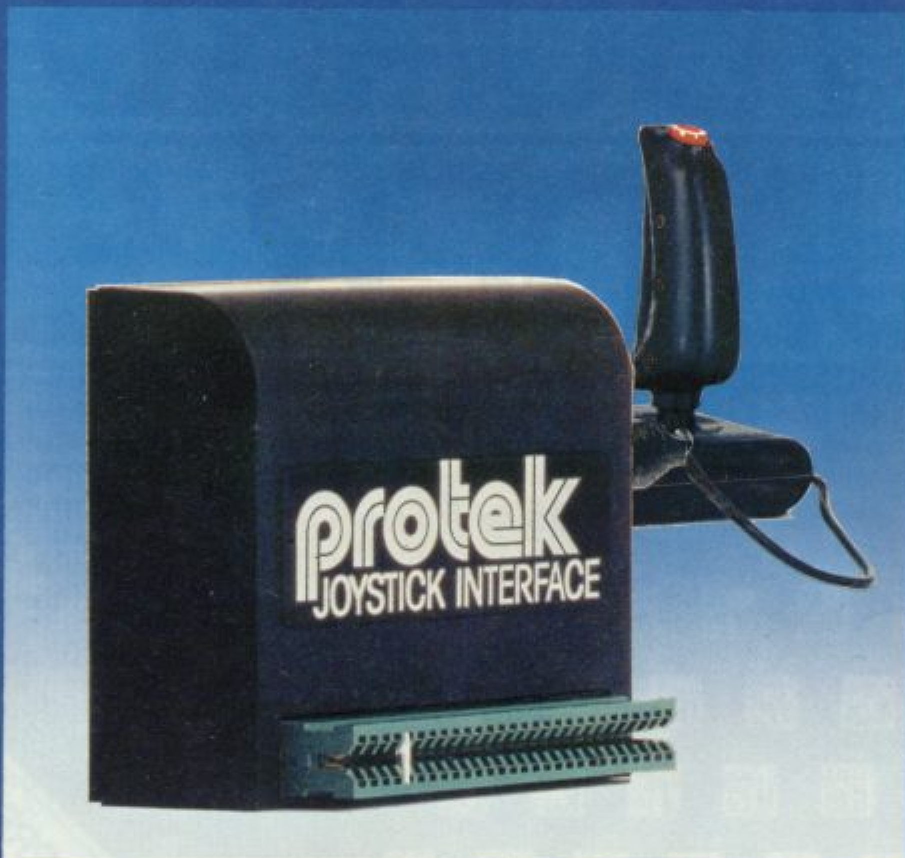
Swedish ZX-club: Sinclair Datorklubben, Box 1007, S–122, 22 Enskede, Sweden.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).

PLAY TH

Arcade Action For The ZX Spectrum

SPECTRAVISION JOYSTICK £9.95 (arcade action, pistol grip, ATARI® Compatible)



If you want Arcade quality control for your Sinclair ZX Spectrum, you'll find the Protek combination hard to beat. The interface is compatible with a range of software including a number of titles from: ULTIMATE, SILVERSOFT, RABBIT SOFTWARE, QUICKSILVER, QUEST, PSION, NEW GENERATION SOFTWARE, IMAGINE, OCEAN, plus many more.

The protek joystick interface is simple to use. It just plugs in at the back of your Spectrum and is compatible with any "Atari type" Joystick Connector. We recommend the Spectravision Joystick at only £9.95 for Pistol Grip Joystick with a top and base fire button plus specially contoured shape and rubber suction cup footing for single hand operation.

Protek JOYSTICK INTERFACE £14.95

STOP PRESS * Now compatible with Zzoom * Jet Man * Kong * and Grid Runner



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Woolworth and HMV to stock Spectrum

WOOLWORTH has moved into microcomputers. The store, which already features video games, is stocking a selection of models at 160 branches.

The range includes the Atari 600XL, the Commodore Vic-20, the Commodore 64 and the 16K and 48K Spectrum. Proof of the Spectrum's popularity is that another 500 branches of Woolworth and Woolco will be selling that machine alone.

Backing the move into computers, a comprehensive range of software will be on sale at all the major Woolworth and Woolco shops. Tapes will be from the computer manufacturers as well as from software houses like Parker, Imagic and Activision.

Following the same trend towards high-street computer shops, HMV, the famous record and music chain, is opening a computer software department at its London Oxford Street store. The stock covers about 75 computer games for the Sinclair machines, the Vic-20, the Oric, BBC, Atari 400 and 800, and the Dragon 32, and HMV pledges that it will order specially any game a customer requires and is not in stock. The new department is intended to test the software market and if it is successful HMV may be opening more computer departments in other branches.

W H Smith has announced that it is opening three new computer shops at Cardiff, Exeter and Kensington High Street, London. Smiths already has computer shops at Birmingham, Croydon and Northampton and computer know-how departments in 250 branches all over the country.

Besides software, computer books and magazines, the shops stock the ZX-81 and Spectrum, as well as the Acorn, BBC and Electron, the Commodore 64, and the Apple IIE business machine.



Gold seekers still on competition trail

AUTOMATA is still looking for a winner of its **Pimania** competition. The adventure is selling well but so far nobody has managed to find the diamond-encrusted Golden Sundial which has been valued at £6,000.

"One or two people are going to some very interesting places," says Christopher Penfold, author of the game. "I cannot say any more than that, except that the man who is planning to go to Bethlehem for Christmas day is wrong."

While Pimaniacs are still searching, Automata has added another competition to its repertoire. It is called **My name is Uncle Groucho, you win a fat cigar,** and the prize is a trip to Hollywood for two, with a flight by Concorde one way, a trip on the QE II on the way back, and £500 spending money.

Billed as a game for the adventurous adventurer, it consists of a quest for a mystery personality. "There are only about six million people it could be," says Penfold, "so it should not be too difficult."

The competition closes on June 1, 1984, the winner being the first correct entry out of a hat.

Artic Computing has ceased promoting the software for its **Krakit** competition, although existing entries are being taken into account. Managing director Richard Turner says: "A number of people decided not to buy the cassette because their friends told them how difficult the game was."

Krakit is still being marketed in the U.S. by the International Publishing and Software Co and the jackpot prize has risen from an initial £10,000 to £14,000.

Talent spotters

A NEW FIRM, Micro Gold, is prospecting for talent among little-known software writers. The aim is to market through the retail trade games and eventually educational tapes for the Spectrum, Dragon, Oric, Commodore and BBC computers.

Micro Gold has sent circulars to programmers who have been advertising by mail order and has received an encouraging response.

"Almost a quarter of those to whom we sent circulars have expressed interest", says software manager Tony Rainbird. "A few of their programs show definite promise, although the general standard of quality is disappointing."

Micro Gold plans to keep prices low by bulk purchasing and shared advertising. To promote its wares it will be retailing its first releases, two Spectrum games called **Race Ace** and **Run, Baby, Run,** at £2.75.

The company is also offering programmers back-up services such as quality control, production of labels and cassette inserts, and supply of blank cassettes.

Micro Gold is at 19 Stable Croft, Chemsford, Essex CM1 5YX.

Software library survey

A SURVEY by the Sinclair Owners Software Library at Liss, Hampshire, has produced some surprising results. Of 300 people who replied to a questionnaire sent during the summer, 49 percent said they regularly bought tapes they had hired previously from the library and liked. That seems to contradict the oft-held theory that the existence of software lending libraries harms software sales.

More news on page 18

Continued from page 17

On average, members of the library bought eight tapes in a period of six months, roughly one every three weeks. They spent an average 11 hours a week with their computers, although some recorded figures of up to 50 hours a week. Adventure games topped the popularity league, followed by games, simulations, programming aids and educational tapes, in that order.

Spectrum owners outnumbered ZX-81 owners by about two to one, but tape hires were in the ratio of five to one. Many of the ZX-81 owners also had Spectrums; among Spectrum owners the 48K was the most popular version.

Communication gap with issue three

SINCLAIR RESEARCH has admitted to a failure of communication over the introduction of issue three Spectrums last July. The company changed the Uncommitted Logic Array on the new model to make it compatible with a wider range of TVs than earlier issues.

The difficulty was that the modification gave rise to difficulties in loading both commercial tapes and program listings published by magazines.

"We did not announce the change at the time because we did not want people to think there was anything wrong with issue one and two Spectrums," says a company spokesman. "Unfortunately that caused problems for people who unwittingly bought the latest machines."

For those writing their own programs or using magazine listings, the problem can be solved by changing the IN command. Where it would be followed by 255 on earlier models, the number should be 191 for the issue three Spectrum, 254 should be 190, and 253 should be 189.

Sinclair Research disclaims all responsibility for commercial tapes which do not work on the latest model, so the only recourse is to send any such tape to its maker and ask for a replacement which works.

Micros at Northern show

MICROS will be among the exhibits at the Northern Home Entertainment Show 84, which is to be held from January 19-22 at the Excelsior Hotel, Manchester Airport. Sponsored by Laskys, one of Britain's biggest retailers of home entertainment equipment, and Morgan Grampian, which publishes *Hi-Fi for Pleasure,* the show aims to cover all aspects of the home entertainment market, from hi-fi and video to computers, peripherals and software.

"Judging by the success of five consecutive hi-fi and video shows at the Excelsior, we expect an enthusiastic response from exhibitors and visitors," says Laskys managing director Peter Klein.

The ZX Microfair, a two-day event featuring every conceivable item of hardware and software applicable to Sinclair computers, takes place at Alexandra Palace, London, on December 3-4. Tickets are £1 for adults, 50 pence for children.

Interface Two launched

HARD ON THE HEELS of the Microdrive and the hand-held TV, Sinclair Research launched its Interface Two at the end of September. Billed as a peripheral for beginners and experts, it costs £19.95 and allows Spectrum owners to load cartridge software and use any joystick with a nine-way D plug.

At £14.95, the cartridges are not cheap but Sinclair Research claims they are fast and easy to load.

Because the whole program is stored on the cartridge, leaving the computer RAM unused, any program will run on a 16K machine even if it was written orginally for 48K.

The cartridges already available include games like Space Raiders, Cookie, Hungry Horace and Jet Pack, as well as chess and backgammon.

True to form, Sinclair Research is offering the Interface Two for sale by mail order only in the early stages. "The response has been good so far," says a company spokesman, "but it is too early to say how sales will develop.

We cannot predict when Interface Two will be available in the shops."

Top 20 magazines

SINCLAIR USER, *Sinclair Programs* and *Sinclair Projects* are all included in a list of 20 computer magazines which W H Smith is recommending for sale by its nation-wide branches.

Faced with a proliferation of computer titles — there are more than 70 computer-orientated publications, of which 14 have appeared since July — Smiths has decided to restrict its range to those which it regards as the most worthwhile. Branch managers still have the final say on which magazines to stock but from now sales will be monitored to keep the top 20 list updated constantly.

Sinclair User was top in popularity in a recent survey conducted by Gallup, with a readership of 14 percent of micro owners. *Sinclair Programs* was in joint second place with a readership of 10 percent. Latest figures published by the Audit Bureau of Circulation have put *Sinclair User* in third position among all micro magazines, with a circulation of 74,721.

SPECTRUM TOP TEN

Program	Last Month	Company	Memory
1 Scrabble	—	Psion	48K
2 Jet Pak	2	Ultimate	16K
3 Hobbit	—	Melbourne House	48K
4 Flight Simulation	1	Psion	48K
5 Trans-Am	—	Ultimate	16K
6 Horace & the Spiders	4	Melbourne House/Psion	16K
7 Horace Goes Skiing	—	Melbourne House/Psion	16K
8 Superspy	5	Shepherd	48K
9 3D Desert Patrol	—	Computer Rentals	48K
10 Ah Diddums	10	Imagine	16K

Business software courses

THE INFORMATION Technology Exchange at Milton Keynes is mounting a series of courses designed to help people in business gain a practical knowlege of computers. Courses range from a one-day event aimed at people with no previous experience of computers to a two-day series covering a range of business applications.

There are also evening classes to help parents keep pace with children learning about computers at school.

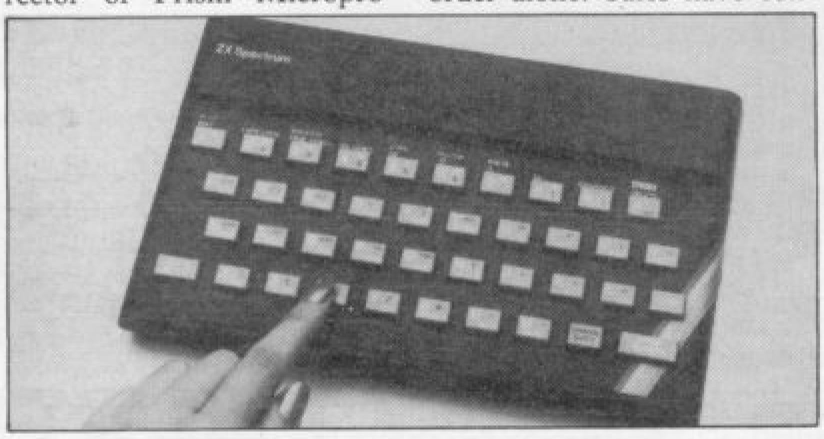
Courses are repeated regularly and cost from £10 per session to £125 for the two-day series. Details from the training administrator, Information Technology Exchange, 429 Midsummer Boulevard, Saxon Gate West. Milton Keynes MK9 2HE. Tel: 0908-668866.

Sinclair overtaken by Christmas demand

SPECTRUMS are likely to be in short supply this Christmas. "We thought we were being far-sighted when we stockpiled 100,000 machines but we have already received orders for 200,000", said a Sinclair spokesman. "It may well be that retailers are being over-optimistic in their estimate of customer requirements," he added.

Bob Denton, managing director of Prism Microproducts, which distributes Sinclair machines, comments: "The rush for Spectrums just before Christmas is nothing unusual but this year it appears to have started a month earlier."

Part of the reason has been the gradual move from mail order sales to retail outlets. Last year, Sinclair Research sold 75,000 Spectrums over the Christmas period by mail order alone. Sales have continued at that level throughout the year, and the sudden glut of orders from shops and dealers at the end of the summer took the company unawares. "There may be a temporary shortage," says Sinclair Research, "but it should not persist."



Silver Fox

WE APOLOGISE for the Silver Fox Communications advertisement which appeared in our November issue. It is our policy not to print material which might offend any of our readers and the inclusion of the advertisement was an inadvertent error.

No further advertisements of this nature from Silver Fox Communications will be published in the magazine.



EXCITING ADDITIONS FOR YOUR HOME COMPUTER

THE MAPLIN TALK-BACK for ZX81 and VIC20

Now your computer can talk

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Full construction details in Maplin Projects Book 6. Price 70p. Order As XA06G.

SOUNDS GENERATOR FOR ZX81

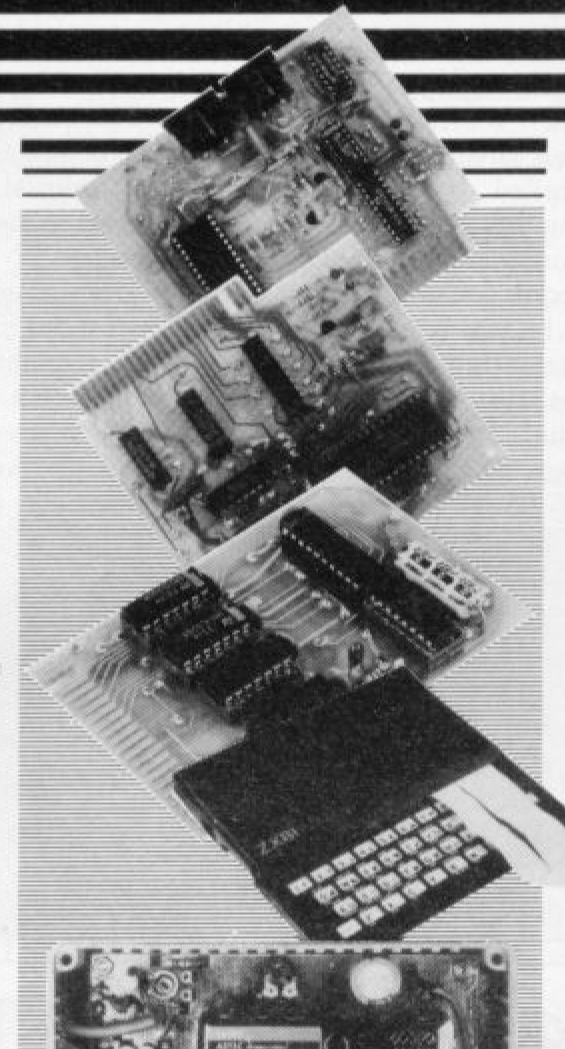
3-Programmable tone generators with programmable attenuators turns your ZX81 into a mini-synthesiser.
Noise generator with 3 pitch levels enables the creation of most special effect sounds.
Single address access via BASIC with PEEK and POKE. Connects directly to expansion port socket or motherboard.
Complete kit. Order As LW96E. Price £10.95.
Full construction details in Maplin Projects Book 5. Order As XA05F. Price 70p.

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Two bi-directional ports for a total of 16 input or 16 output lines.
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On board address selection allows for expansion to 6 ports with two boards.
Complete kit. Order As LW76H. Price £9.25.
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A CCITT standard modem that connects directly to your telephone line via a B.T. approved transformer. Transmits and receives simultaneously on European standard frequencies at 300 baud. May be used to talk to any other 300 baud European standard modem including the Maplin Computer Shopping modem on 0702 552941 and any British Telecom Datel 200/300 Service modem. The modem's computer interface is RS232 compatible.
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- ★ Complete with electronics to make "Shift Lock", "Function" and "Graphics 2" single key selections.
- ★ Powered (with adaptor supplied) from ZX81's own standard power supply.

Full details in Project Book 3 (XA03D). Price 70p
Complete kit (excl. case) £21.90.
Order As LW72P.
Case £4.95. Order As XG17T.
Ready built-in case £29.95.
Order As XG22Y.



ZX81 TV SOUND

ZX81 sound on your TV set.
Video reversing switch for normal or inverse video display. Can be used with the Talk-Back or Sounds Generator kits.
Complete kit. Order As LK02C. Price £19.95.
Full construction details in Maplin Projects Book 6. Order As XA06G. Price 70p.

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Our ZX81 Extendiboard plugs directly into the ZX81 expansion port and will accept a 16K RAM pack and three other plug-in modules simultaneously. Parts are sold separately as follows:
PCB Order As GB08J. Price £2.32.
Edge Connectors (4 needed) Order As RK35Q. Price £2.39 each.
Track pins (1 pack needed). Order As FL82D. Price 85p per pack of 50.

INTERFACES for MODEM

Interfaces for most popular home computers which do not have RS232 ports will be available shortly. An interface for the ZX81 that includes a complete Machine Code Communications Program is available. Order As LK08J (ZX81 Modem Interface Kit). Price £24.95.
Full construction details in Maplin Projects Book 7. Order As XA07H. Price 70p.

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Tel. Southend (0702) 552911 (Sales).

159-161 King St., Hammersmith, W6. Tel. 01-748 0926. 284, London Road, Westcliff-on-Sea, Essex. Tel. (0702) 554000. Lynton Square, Perry Barr, Birmingham. Tel. (021) 356 7292.
All prices include VAT & carriage. Please add a 50p handling charge to orders under £5 total value.

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6 programs of multiple choice questions, covering properties of parallel lines, triangles, various polygons and circles. All questions use generated numbers. An explanation of the correct answer is given.

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Please send me:

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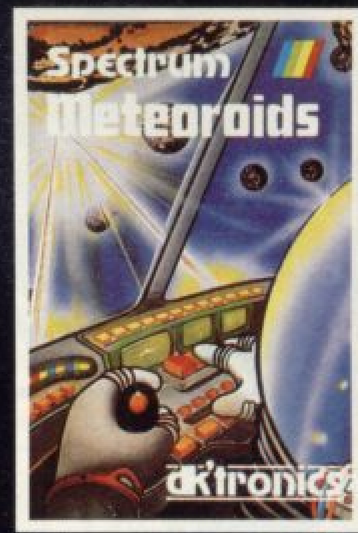
See page 179 for further details and order form.



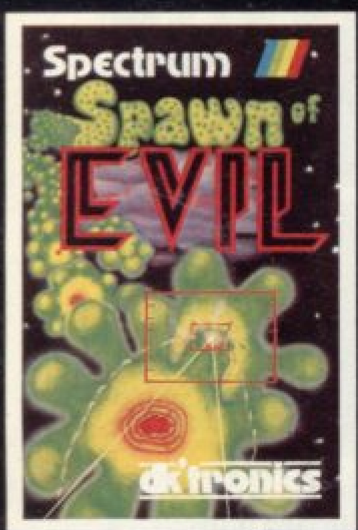
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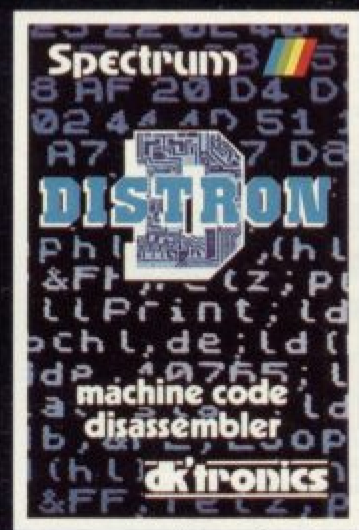
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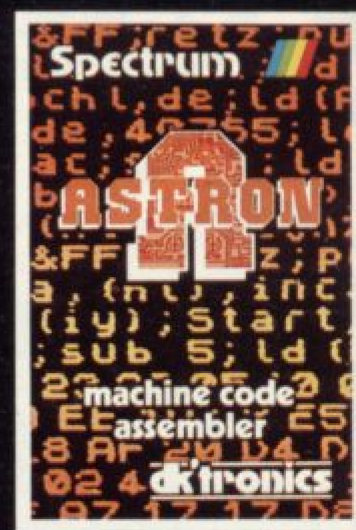
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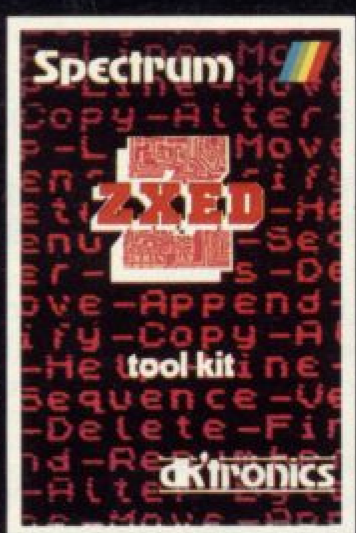
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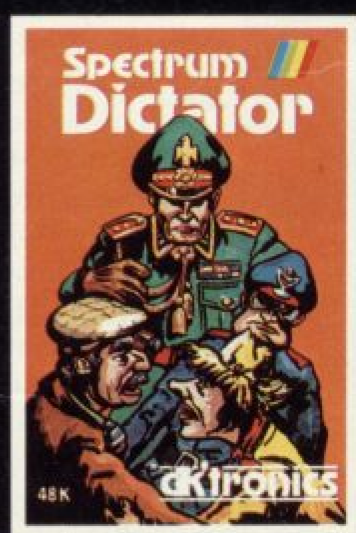
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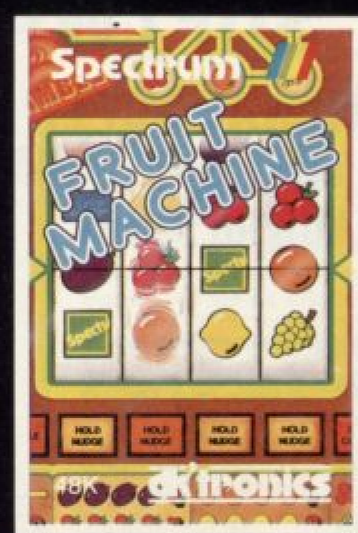
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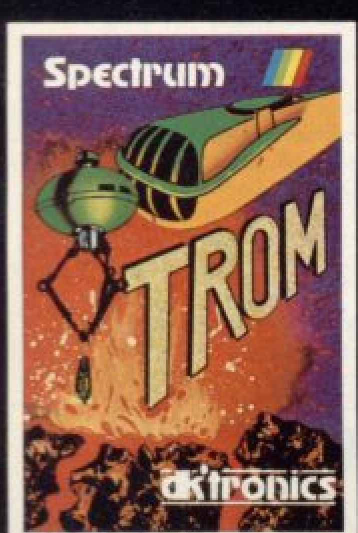
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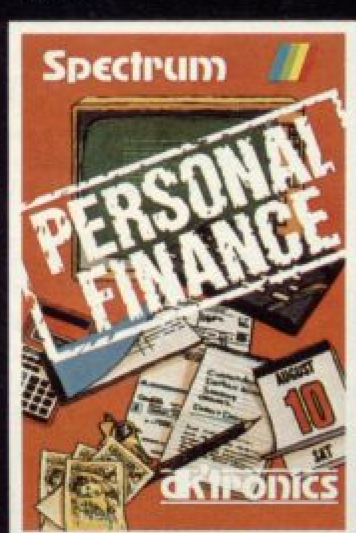
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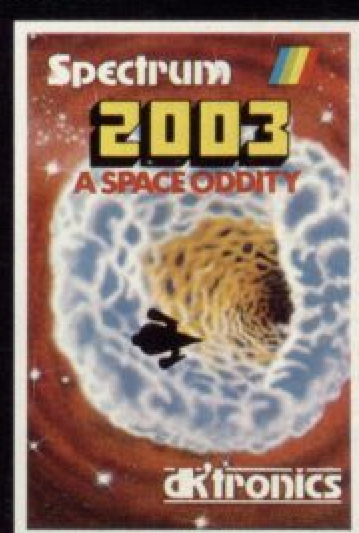
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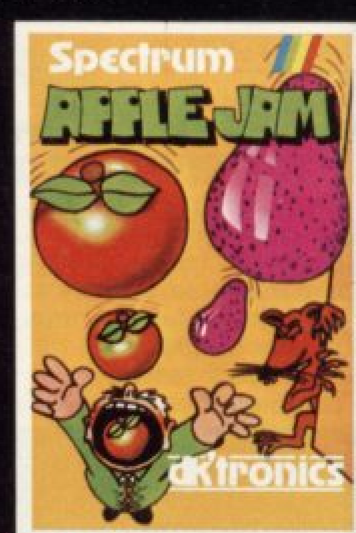
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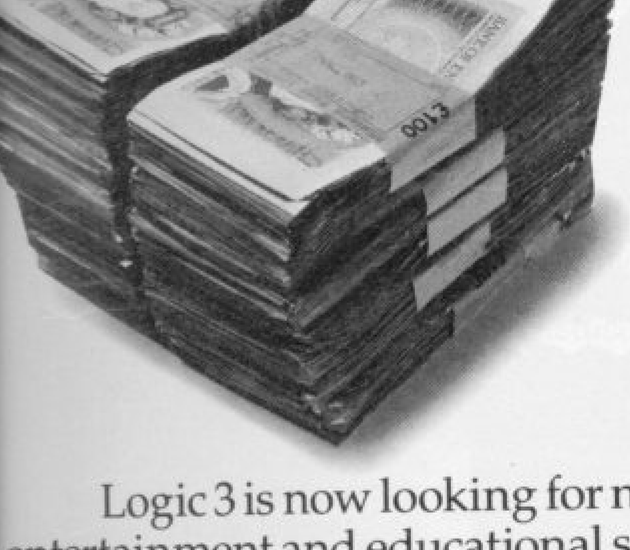


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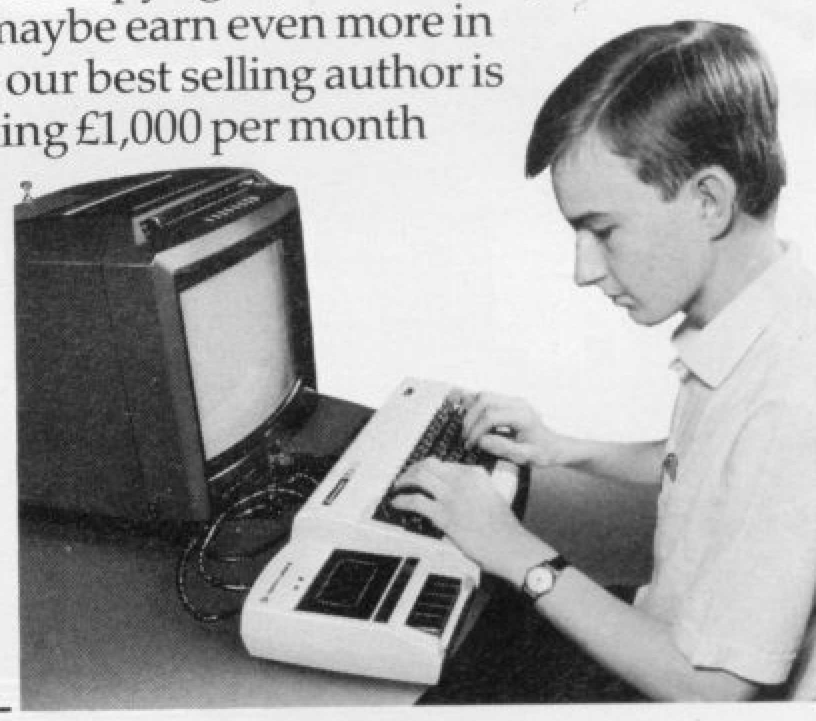
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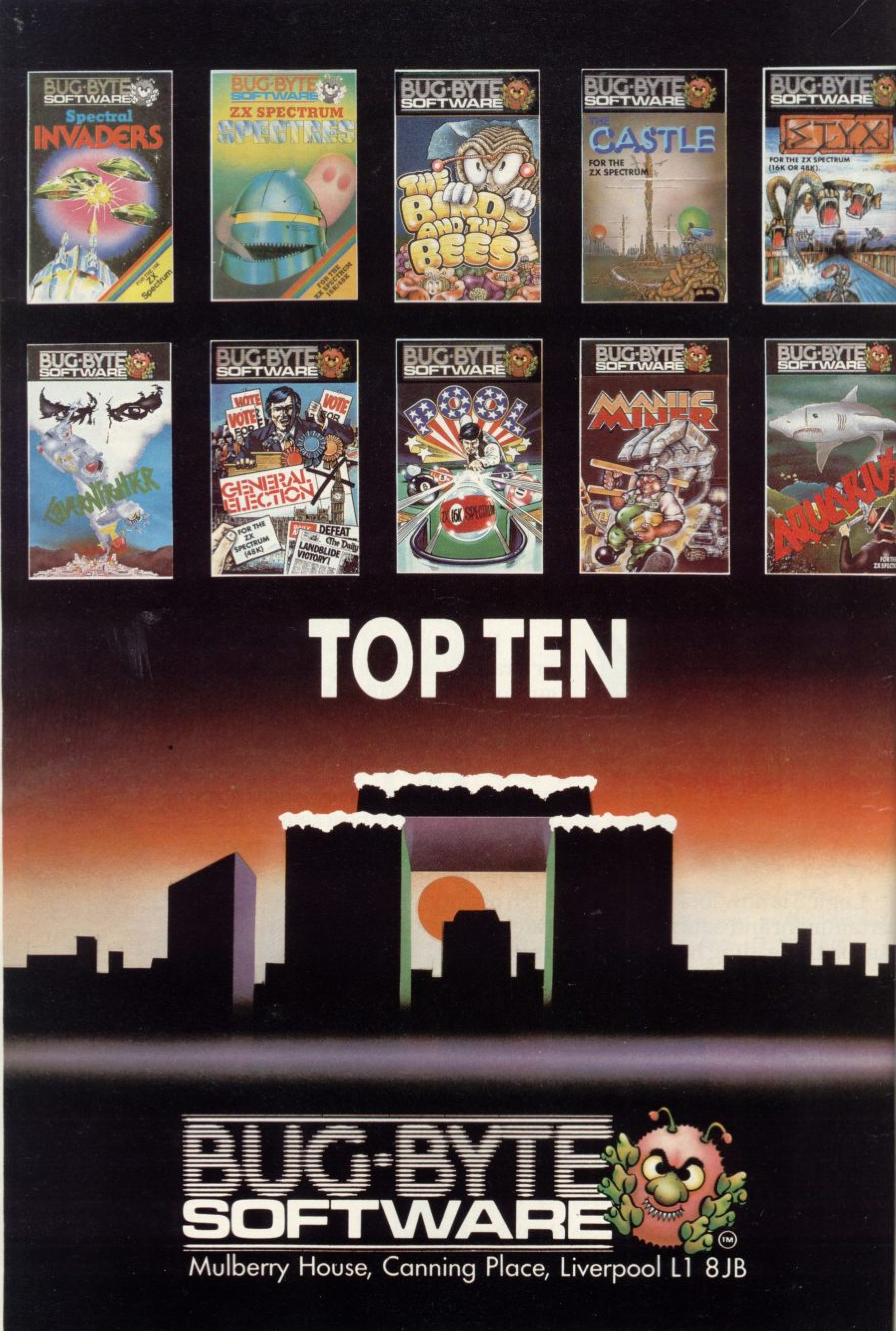
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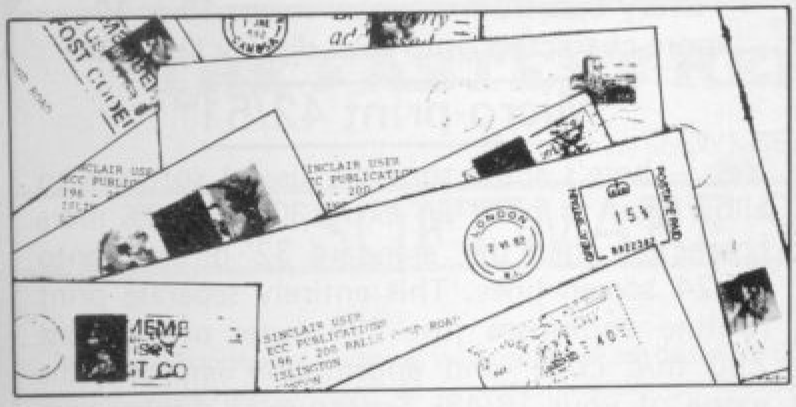
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More serious applications

I READ G A Rooker's letter in the October edition and I support his view that the market is ready for a change in emphasis from programs on games to programs with a useful application.

I have already contacted him proposing my calorie-reducing program Dieta for his directory which, I expect, will be very interesting to consult.

I understand the reluctance with which your magazine may greet some programs on serious applications because, judging from the few reviews published so far, many of them offer little else than information which would be more adequately arranged in a book.

I am sure that there are many readers who bought the Spectrum initially to play games but have realised subsequently that the machine is capable of a range of diverse applications at home, in school and at the office, and who would welcome regular information on what is being done in the field of useful application.

L Cayalieri Dunbar,
Culcheth
Warrington.

Useful ROM routines

OWNERS OF 48K Spectrums might be interested in the following ROM routines which I have found useful:

I think most of the routines will work with 16K Spectrum.

Has anyone found how to eliminate "Start cassette, then press any key" useful when making multiple SAVES?

A Field,
Epping,
Essex.

Odd things in Comlogs

SINCE SENDING you my program Comlogs, which you published in October, I have discovered some odd things which can happen after a number of repeats and rubouts have been used. They can be remedied by the following corrections:

Lines 450-530: substitute j$ for i$ throughout.

Line 444 should read:

444 IF ff THEN LET g$="(2sp)"+g$(m TO)

Line 962 should read:

962 IF ff THEN LET g$=g$ (6 TO)

David Bye,
Saffron Walden,
Essex.

Unanswered questions

ALMOST every month a letter is printed stating what a wonderful magazine *Sinclair User* is. It is the letters page I want to complain about.

People write constantly asking questions but where are the answers? The latest example was in the October issue, when a man from Spain wrote explaining about his deaf granddaughter and how computers might help her.

He asked desperately if there were programs to help a deaf but intelligent girl further her education. Now that is a question and the man wants an answer, as do the readers, especially those who know deaf children.

What is the point of printing letters with questions if there are no answers?

Dietmar Osman (16),
Farnham,
Surrey.

• *We hoped that some of our readers might be able to offer helpful suggestions.*

Interesting discovery

FOOLING AROUND with the DRAW statement I found an interesting bug. If you type-in:

10 BORDER 0: PAPER 0: INK 2
20 PLOT 70,120: DRAW 4,4,4040

it draws a kind of circle which can be changed if you change the number 4040 to almost anything.

Jeremy Henderson,
Craigarad,
N. Ireland.

Games errors unforgiveable

I HAVE used a Spectrum at school for six months and was thrilled when I at last saved enough money to buy a 48K model. I was also pleased at the offer of five software tapes with my computer at Rumbelows, which meant I could get my software collection off to a flying start.

Eagerly I loaded my acquisitions into my Spectrum and was soon blasting asteroids and flying light aircraft on my television screen. Then it came to two tapes produced by the relatively new company Visions and I read the instructions carefully on their tapes. Both said 'load "" ' and so that is what I typed into my keyboard.

The first game, Sheer Panic — a version of what on the BBC computer is called Monsters — refused to load until in desperation I typed 'load "" code ' after which I was treated to a very good version of the game.

The second, Pitman 7, involved saving the lives of two groups of seven miners trapped underground. The title screen was impressive and I was treated to several screens of instructions, followed by a graphical demonstration of the control keys 'PRESS "T" TO PLAY'

more letters page 30

"THE FASTEST REPLY I'VE EVER HAD"

(R. L. DAWKES, NEW ZEALAND)

SOFTWARE SUPERMARKET

At Software Supermarket, we play all the programs we can find for the Spectrum (and the BBC micro) and put just the best of each type into our ads and catalogues. We don't have the biggest list of Spectrum programs, just the best - from many different program companies, large and small, famous and just-about-to-be-famous. We produce no programs ourselves, so our choice is completely impartial.

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WIDGITS LIKE KIDS! *"An excellent set of programs...simple to use...of great value to young children." (HomeCompWkly)* TEN PROGRAMS for young children on 3 cassettes. All with great, arcade-style graphics. 3 shape sorting games. 4 counting games. 3 adding and subtracting games. Kids 3-6, we reckon. This could be the present they play with longest! All ten programs, just £15.75.

3D SPACE WARS Brilliant 3D Space Battle that's brand new. Demo mode. Good, clear screen display of your instruments: cockpit view fills 2/3rds of the screen - long-range scanner is actually legible! Refueling in space is great - just like the RAF, takes real skill. KEMPSTON, AGF Joysticks O.K. (Hewson) £5.95.

48K SPECTRUM ONLY

GROUCHO Find the Hidden Star - and win a trip to Hollywood! A mad adventure with lots of good tunes and some very good cartoon-type animation. Follow Groucho and the Piman around the U.S.A. Discover the 22 clues - and name the Hidden Star - and you win the trip! (Entries close 1/6/84.) A brilliant follow-up to Pimania, using every bit of the 48K. FREE 'hit single' on flip side may contain clues, too! No joysticks. (Automata). £10.

GAMES DESIGNER At LAST! No expert programming knowledge is needed to create your own SPRITE-BASED MACHINE-CODE ARCADE GAMES with this tape by John 'Timegate' Hollis. EIGHT EXAMPLE GAMES included on the tape - four written by complete amateurs! Clear 20-page manual. Design your own aliens, backgrounds, sound effects, attack waves, quickly and easily - and then save the games you have created! Joystick option for your games, too. (Quicksilva) £14.95.

MANIC MINER *"Certainly the best arcade game around for the Spectrum." (PopCompWkly) "Will probably be voted the No 1 Spectrum game this year." (HomeCompWkly)* Based on the USA arcade chart-topper 'Miner 2049er'. Superb graphics and sound as you search through 20 screens - each one a different arcade game. 20 screen demo mode: KEMPSTON joysticks. (Bug-Byte) £5.95.

HALLS OF THE THINGS *"For me this is THE game of '83...hours and hours of sheer pleasure." (ZX Comp) "Uses 99% of the available RAM...one of the best games we've seen for a long time." (Which Micro?)* Explore an 8-storey maze, find treasures, avoid nasties. BUT this time you can see exactly where you are and what you're doing as the maze scrolls as fast as you can move. Brilliant graphics (try waving your sword about!) and 19 command keys. (Crystal) £7.50.

JOHNNY REB A new full-screen graphic battle game: NOT an arcade game. You fight out a struggle for a river crossing during the American Civil War. 1 or 2 players. Choose your side, equip your army and fight the battle: great battlefield display. Fight to the death or within time limits as you wish. New, different, intriguing. No joysticks. (Lothlorien) £5.50.

THE HOBBIT *Superior to any other adventure game available." (Yr Comp) "Takes first place...for quality and value for money." (S. User)* The adventure that made 1983 famous! Free 285-page illustrated book with clues to this unique real-time adventure. 80 locations: 30 beautiful full-screen pictures. 500-word vocab: 16-page manual. 40K of program took 4 people 18 months to write! No joysticks. (Mebourne) £14.95

GO TO JAIL *Excellent graphics are used to make a very impressive display indeed...highly recommended." (ZX Comp)* The best computer version of the famous game we've ever seen. From 2 to 5 players (including the Spectrum at last! It's ruthless, but honest.) Every original feature is faithfully reproduced and the screen display is miraculous. No joysticks. (Automata) £6.00.

KONG The mightiest Spectrum Kong of all! Full 4-screen machine-code program - just like the arcades. Jump the rolling barrels, and the fireballs. Avoid the flying dumb-bells: catch a moving lift. Smash things with your hammer to score more. Demo mode: training mode for each screen: bonus objects: Hall of Fame and a pretty girl shouting 'HELP!' KEMPSTON, QUICKSHOT, PROTEK Joysticks. (Ocean) £5.90.

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If you do not want to cut this magazine, write your order out carefully on plain paper and quote this number: **SU13**

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Continued from page 27
said the instructions, so I did and was disappointed to find that having done so and being given such a good display of graphics, or so I think, the game refused to work.

The game also refused to work back at the shop and at a second branch, as did three other copies. In my view the first mistake was sloppy and if common to other copies a note should have been made on the tape box. The second example is unforgiveable, especially as it is from what is obviously a new company facing the fierce competition of the computer software scene.

Keep up the good work. *Sinclair User* is one of the best computer publications on the market.

**Dean Gaygan,
Mitcham,
Surrey.**

Repetitions avoided

I OFTEN see listings with five or more IF . . . THEN statements after one another. The same thing can be accomplished by this:

IF A=5 THEN GOTO 1000
If B=7 THEN GOTO 1500
GOTO (1000 and A=5)+ (1500 AND B=7)+ . . .
IF Z=9 THEN PRINT "A"
IF A=10 THEN PRINT "B" PRINT ("A" AND Z= 9)+("B" AND A=10)+. . .

With a little experimenting almost everything can be handled.

To Alistair Hodgett's question my answer is:
LET X=VAL INKEY $

**Max Berle,
Geel,
Belgium.**

No fault with ZX printer

I ENJOY the pleasure of reading *Sinclair User* and often I read about people having great problems with their ZX printers. Recently I bought one for £39.95 plus a free offer of five rolls of printer paper and I am very impressed with it. I do not see anything wrong with it and I feel it must be the fault of the users mishandling them. So far as I am concerned it is well worth its price and more.

**P Groenewald,
Woodbridge,
Suffolk.**

Surviving criticism

I WILL NOT beat about the bush with "Thanks for a great magazine". Fifty per cent of *Sinclair User* is trash. Hewson and Mind Games are its only redeeming features. Worst of all are the reviews. You could gain just as unbiased an opinion if you read the side of the cassette in which the game is supplied.

Believe it or not, the computer industry, including periodicals, will survive if you criticise software, rather than your 'rush out and buy' attitude.

What is it I see in *Sinclair User* two months or so ago? A slanging of Arcadia. That — and I am sure the people which made Imagine profits top a quarter of a million pounds would agree — was and is in the top three space attack games for the 16K Spectrum.

We are not mindless idiots, so don't treat us like them.

**David Mitchell,
Malvern Wells,
Worcs.**

Listing any program

I FOUND that you can list any program with a simple method.

Type FASt NIL
RAND USR 836 N/L
then press play and load the tape you cannot list.

You will find when the loading has finished you will get an error report C/0
Type LIST 1. N/L

You will find that you can list any program.

**P W Borgerson,
Southport.**

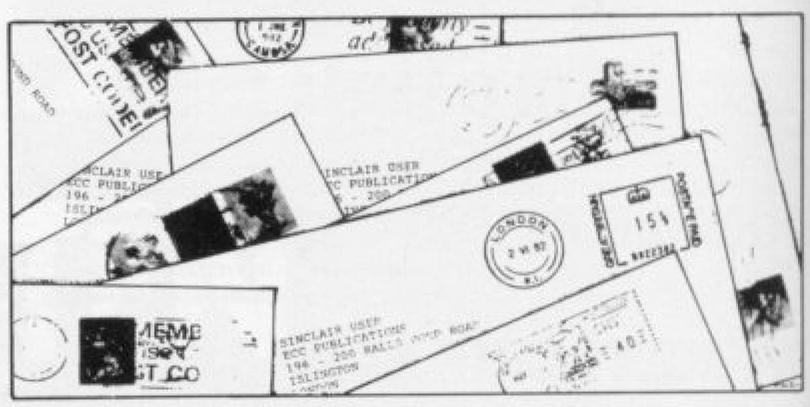
Unfortunate experiences

I BOUGHT my first computer in July and joined the growing trend. I plugged-in, switched-on and nothing happened. I changed the faulty one for another ZX-81. To my horror it did not work. Then I swapped it for a Sinclair starter pack which included 16K RAM pack and Backgammon cassette, saving £29.

I ran the short memory test program and 1K appeared on the screen instead of 16K. I changed the RAM pack and now have a working computer and RAM pack. A friend of mine has also had the same trouble — only he is on his sixth ZX-81 and third RAM pack. Even now he has had to stick pieces of polystyrene in to hold the RAM pack still because of severe wobble.

Are we the only unfortunate ones or is the Sinclair standard falling?

**Simon Pearce,
Bridgwater,
Somerset.**



Geometrical patterns

IT SEEMS that the geometrical figures drawn by R Wysocki's program
10 PLOT 100,50: DRAW 100,100,x
are a series of 252 straight lines, each turned an angle of x/252 radians to the one before.

Some regular polygons can be drawn, e.g., five-sided (x=100.8*PI), eight-sided (x= 63*PI), 10-sided (x=50.4*PI). Polygons of 3,4,6,7,9 sides do not work, since those numbers divide exactly into 252, which means the series of lines would start and end at the same point, in contradiction to the DRAW command. They can be drawn fairly well by changing, say, to DRAW 3,3,x and making x/252 slightly different from the required angle.

Other interesting shapes include a five-pointed star (x=201.6*PI) and an interlaced polygon with 15 apexes (x=67.2*PI).

In some cases it is necessary to change the PLOT position or alter the DRAW to, say, 50,50,x to avoid the pattern going off the screen.

Changing x slightly, by 0.1 or so, gives a less perfect shape and alters the length of the side. Can anyone find how the computer chooses the length of the sides it draws?

**Don Hinson,
Llanrwst,
Gwynedd.**

more letters page 33

Play with a Griffin

So they take school in their stride



Your children are using a computer at school far more often than you think.

Computers make learning an absorbing game and retain a child's interest and participation.

Griffin Software have selected and adapted for home use, a series of Griffin educational software titles already used in schools.

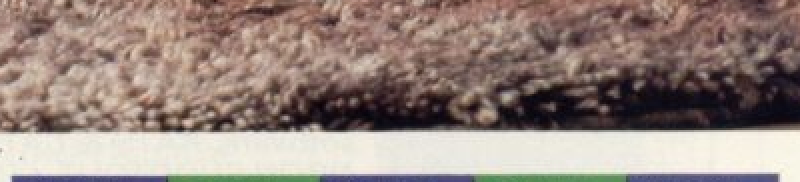
The first six titles suitable for 4 to 8 year olds, are available now.

If you have a ZX Spectrum 48K or a BBC Model B microcomputer at home, you can so easily keep up the school's good work. And the beauty of it is, the child sees it as a game!

Wordspell helps with spelling; Tablesums unravels the mysteries of tables; Fairshare uses Ollie the Octopus to make sense of division; Numberfun makes addition and subtraction easy; Wordgames helps with spelling and expands vocabulary; and with Getset a child is helped with counting.

All good fun!

Griffin Software titles are at W H Smith, Boots, and other computer shops everywhere.



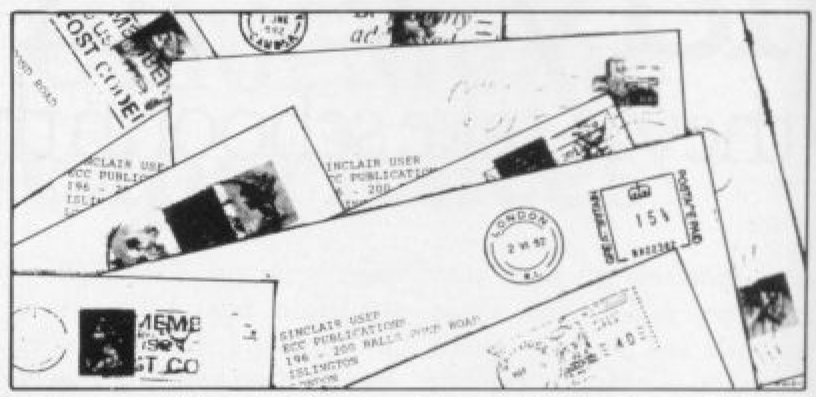
Only £7.99 each to suit the ZX Spectrum 48K *Only £9.95 each to suit the BBC Model B.*

GRIFFIN SOFTWARE

– it's an education.

continued from page 30

Simple way of making shorter statements



IN REPLY to Alistair Hodgett's letter — *Sinclair User*, September — there is a simple way of replacing the lengthy "IF INKEY$="2" THEN LET X=2" statements. The easiest way is to use the line "LET X=VAL INKEY$". The only problem with it is that pressing any key other than keys 0-9 will cause the program to crash. The problem can be circumvented by using this line: "IF INKEY$>="1" AND INKEY$<="9" THEN LET X=VAL INKEY$".

I would also like to comment on the chess article in the same issue. I found it very helpful but I would have appreciated more information and wonder if that may be planned for a future issue.

I have been reading *Sinclair User* since January and I find it extremely interesting. Keep up the good work.

Ciaran Gultnieks (12),
Haxby, York.

Educational self-help

WE NEED educational programs for our *Educational Computing Newsletter*. We are Education Otherwise, a self-help group run by parents for parents, who have taken their children out of state school to teach them at home.

To help our members make the best use of home computers in teaching children we invite programmers everywhere to donate any educational programs they think may be of use to us.

Providing we are not swamped by too many enquiries, our newsletter is available to non-members. Please send a SAE for details.

J E Rupik,
17 Westmorland Street,
Balby, Doncaster.

Helpful POKE commands

WHILE messing around on my Spectrum I found a few useful POKE commands. If you type POKE 23756,0 the first line of your program will become 0.

If you type POKE 23755,100 it will act like the NEW command on the BBC computer. By typing POKE 23755,0 your old program will appear just as it was when you typed it in.

If you type POKE 23658,8 the computer will be set to CAPS LOCK. By typing POKE 23658,0 the CURSOR will be reverted to NORMAL mode.

I hope you find these commands helpful.

N M Fletcher,
Langford,
Avon.


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Amplifier needs sound knowledge

ZXM is a sound box from Timedata complete with amplifier. Based on the 8912 three-tone chip which appears on most sound boards, it also provides a joystick socket. The Atari-type joystick socket will not work with commercial software, as it is based on an I/O port from the 8912 chip and has to be programmed to be available first.

The amplifier and loudspeaker are controlled by a volume control situated on the front of the unit.

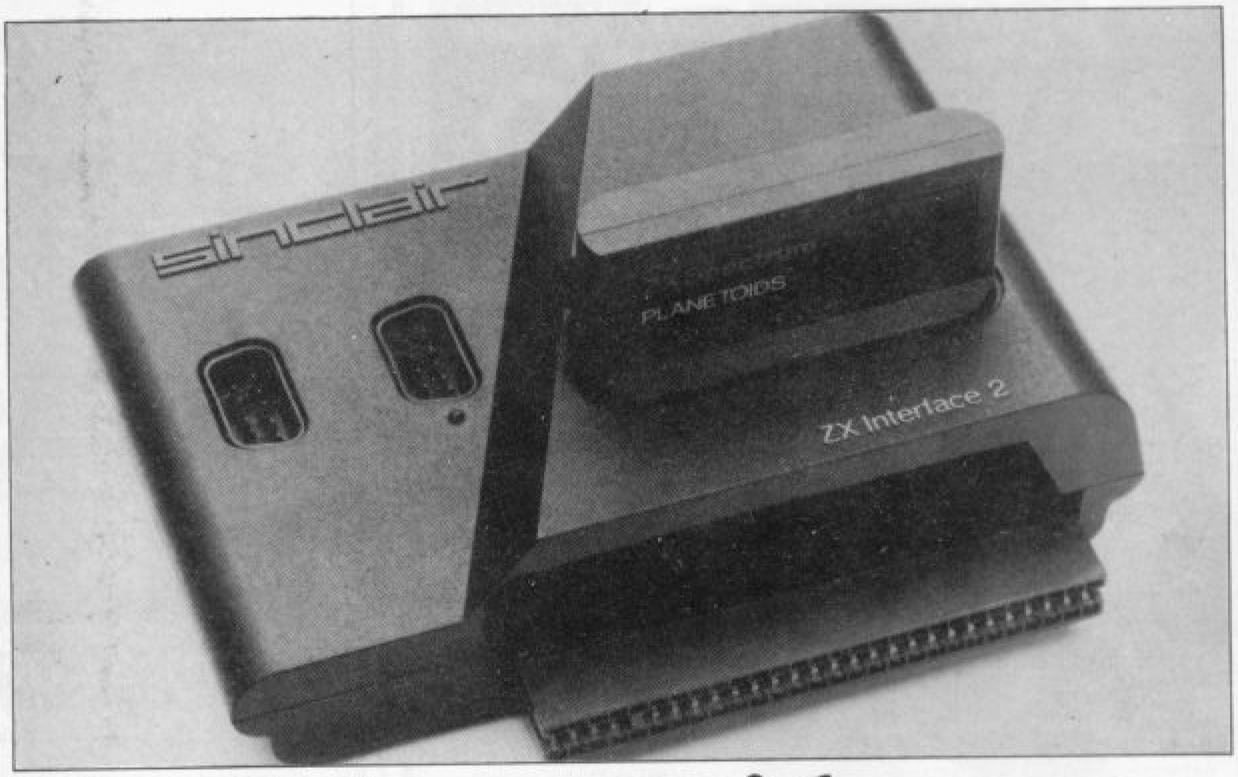
The unit plugs into the edge connector of the Spectrum and has a PCB edge at the back so that other peripherals can also be plugged-in. The edge connector is only 23 ways wide so it fits both the ZX-81 and Spectrum.

The unit is accompanied by a booklet of programs and a tape. The explanations and use of the unit tend to be over-complicated, requiring a good technical knowledge to understand it.

Timedata also makes a speech unit, ZXS. The unit, plus the software provided, allows you to set up a string (S$) of sounds to make up the words in Basic. A machine code routine will put them out to the speech unit, which also has an I/O-mapped device. Unfortunately you will be unable to hear the speech produced unless the unit is connected to an external amplifier such as the ZXM via its 3.5mm. socket.

The speech can be EDIT-ed and changed using the program but the size of the program may make it difficult to incorporate into your programs.

The ZXM costs £29.95 and the ZXS £24.99 from Timedata, 16 Hemmels, Laindon, Basildon, Essex. Tel: 0268-418121.



Sinclair cartridges may be out of step

SINCLAIR has just announced the Interface Two, which has followed the Interface One within a few weeks. Interface Two provides two joystick sockets, which take standard Atari joysticks and a ROM cartridge slot. The joystick ports are non-standard, as the only software to work with them is from Sinclair or Psion.

They operate the number keys only and each joystick operates the first or last set of numbers. Despite the advertisements there is no software built into Interface Two — only a ULA to act as a port for the joysticks. The ROM cartridge socket is also a disappointment, as it provides no special switching to page ROMs in and out.

The cartridge has all 16 address lines and eight data lines on it but, because of the way Sinclair designed the Spectrum, none of the internal memory can be switched off, so the only programs which can be provided can be 16K long versions which will replace the Basic ROM.

They are available by turning-off the power, plugging-in the cartridge and turning-on the power. The games then auto-start.

An interesting point is that Sinclair has saved money by having the bare silicon chip wired direct to the PCB instead of mounted inside the normal IC casing.

A printer connection is provided at the back of the unit to run the Sinclair printer only. That is because none of the other connections is connected. It would seem that Sinclair has produced its last peripheral for the Spectrum.

At £19.95 for the Interface Two and £14.95 for each ROM cartridge, they may not be in great demand unless the price is reduced dramatically. The joysticks are also out of step with software manufacturers who program games to work with the Kempston-type joystick interface. Sinclair Research is the only company selling Interface Two. The address is Stanhope Road, Camberley, Surrey GU15 3PS. Tel: 0276 685311.

Extra keys help save tired fingers

ONE OF the main criticisms of the ZX-81 and Spectrum has been the number of key presses required to access certain commands. Stephen Adams has produced a kit which allows you to add extra keys to your add-on keyboard.

Commands or characters which previously required one of the shift keys to be pressed can now be accessed by a single keystroke. The kit contains all the electrical components needed, with instructions, but as each keyboard uses different keys you must supply your own.

The kit is aimed at users with at least a passing knowledge of soldering and those able to follow a simple circuit diagram but considering that the kit costs only £1.25 including postage and packing, it is worth buying to save tired fingers. It can be obtained from Stephen Adams, 1 Leswin Road, London N16 7NL. Tel: 01-254-1869.

more hardware page 40.

Professional Software for Spectrum and ZX81



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ZX81 16K

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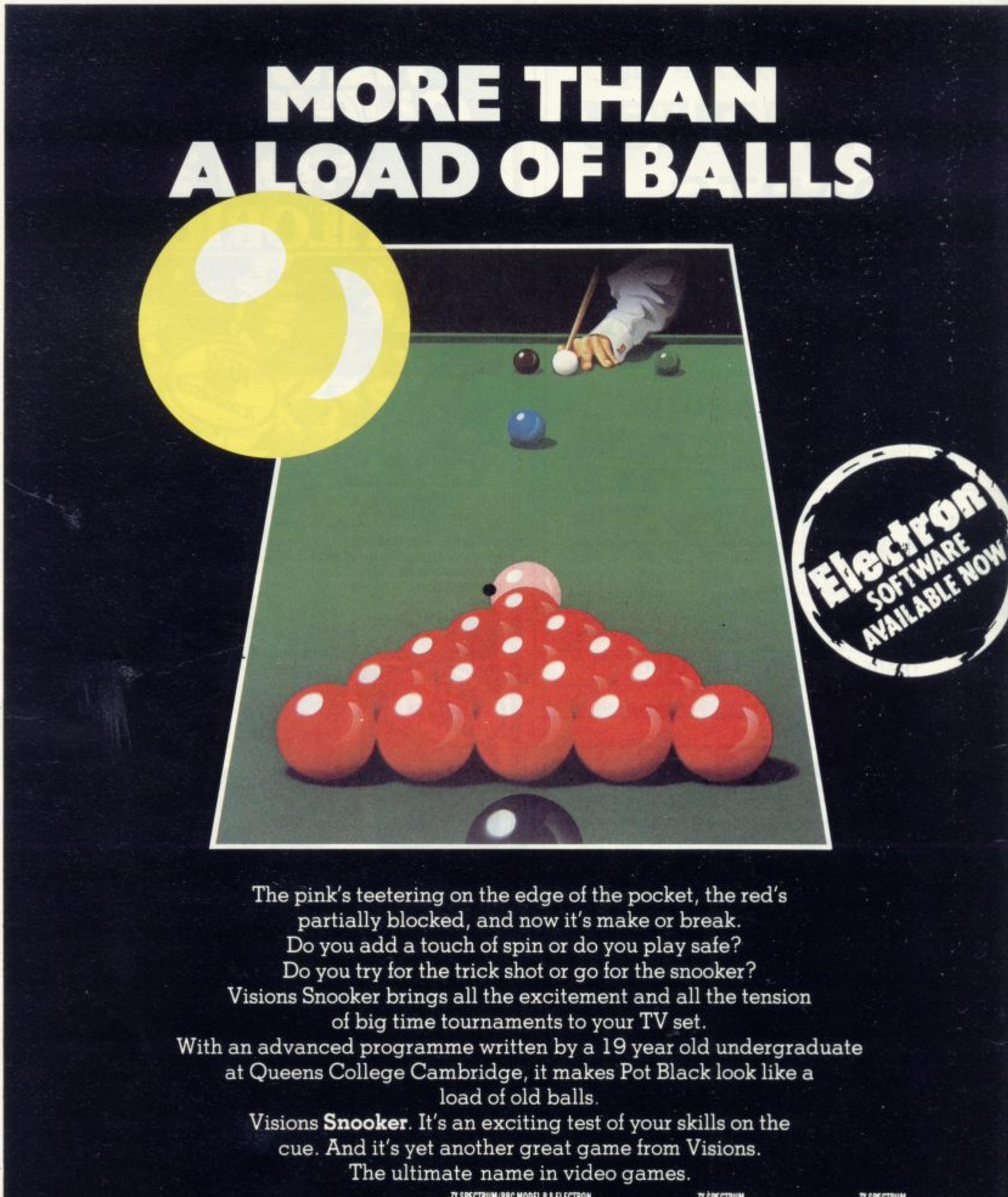
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Clear speech from Currah module

THE CURRAH U Speech module is a black plastic box which plugs into the back of a Spectrum and gives an amazing range of facilities. The unit is approximately 3in. square and ½in. high. Once plugged into the Spectrum expansion port, no more expansion is possible unless a motherboard is used, as it lies flat behind the Spectrum.

There are two leads from the unit. One goes into the aerial socket and the other into the MIC socket. The lead to the TV is plugged into the socket on the back of the unit. That must be done before powering-up the Spectrum.

The unit provides its own copyright message at the top of the screen when powered-up and pressing a key will also start the unit into its keyvoice mode. That is where every key used is spoken by the unit. All the keywords except the tilth (~) are spoken — even the direction arrows which come out as CURSOR. The colours, of course, are not spoken or the various modes.

The keyvoice is controlled by a variable called KEYS and can be turned-off by LET KEYS=0. That can be used directly or in the program and the keyvoice can be turned on again by LET KEYS=1. The keyvoice also works for keys pressed in the INPUT or INKEY$ unless disabled.

Another useful feature is that S$ has been allocated as a speech buffer and any LET S$ command makes S$ into a spoken string. Only letters are allowed, which is a pity, since numbers would be useful. Letters can also be used in brackets to give single or double allophones. An allophone is a sound rather than a letter in speech and words must be programmed to sound correct.

Most words will be satisfactory if typed-in directly but Os, As and some others may need a set of allophones instead. In that respect the booklet with the unit is very good, giving clear examples and a list of suitable alternatives. Unfortunately the variable KEYS does not effect the speaking of S$

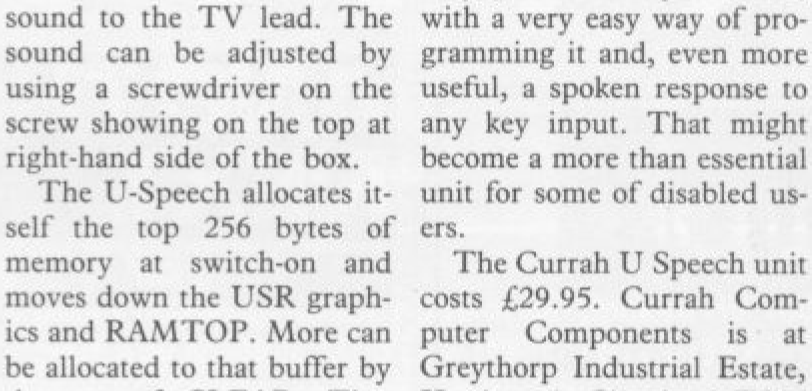
For the technically-minded, the unit contains a ULA which works on a WRITE command from the microprocessor, a ROM containing the keyword speech patterns and SP0256-AL2 speech processor. It also contains a clock for clear speech and an audio modulator to transfer the sound to the TV lead. The sound can be adjusted by using a screwdriver on the screw showing on the top at right-hand side of the box.

The U-Speech allocates itself the top 256 bytes of memory at switch-on and moves down the USR graphics and RAMTOP. More can be allocated to that buffer by the use of CLEAR. That makes it incompatible with some programs which use that space for machine code. Details of the buffer are given at the back of the book for machine code users.

Time must be allowed in all programs for the speech as it is updated only by the keyboard interrupt routine every 50ms. That also means that during SAVE/LOAD/VERIFY/BEEP and dealings with any device connected to interface one — i.e., Microdrive, RS232 or network — no speech should be in progress. That is because the speech will continue as one sound until the operation is finished.

The unit is extremely useful but time has not permitted it to be tested with any other units to see if they clash. What is presented is a very good clear speech box, with a very easy way of programming it and, even more useful, a spoken response to any key input. That might become a more than essential unit for some of disabled users.

The Currah U Speech unit costs £29.95. Currah Computer Components is at Greythorp Industrial Estate, Hartlepool, Cleveland TS25 2DF. The company is intending to make it usable for the ZX-81, BBC and other computers.



Taking off the heat

PR ELECTRONICS has produced a small aluminium box which regulates the power supply to a ZX-81 or Spectrum, thus reducing the amount of heat generated inside the computer.

It will help with problems in using the Spectrum with a TV display, as it eliminates most of the dot crawl. It also helps if you use the computer for a long time, as it prevents crashes due to overheating.

The power pack plugs into the socket on the box and a lead from the box plugs into the computer. All the heat is dissipated through the aluminium box and so a warning label is included. It did not become too hot to touch while being used. It seems to do its job very well, whatever equipment is connected to it.

PR Electronics is at 14 Bretby Close, Bessacar, Doncaster, Yorkshire, and the price of the unit is £8.95.

Interface adds life to ZX-81

THE DDC Colour Interface allows the ZX-81 user to have a 16-colour display on a TV set. It fits on the back of the ZX-81 and the only internal connection required is to the video lead going into the video modulator.

Control is by turning some of the inverse characters into colour controls. They are in the range from Inverse 4 to Inverse Z and they can no longer be used for graphics. All of the block graphics can still be used. Whatever colour character is printed on the screen it will affect the rest of the line until the end of line or until another colour character is reached. A border around the screen is still maintained in the back-

ground colour of red, as when you switch on.

All the colours affect the background colour, as the foreground will normally be black. Inverse graphics will be shown as colour on a black background. The colour character will be shown as a coloured space on the screen. The only difficulty is with editing the lines which contain coloured squares. The normal inverse G, L and K are invisible and there is no way to tell the position of the cursor. You have to watch the blue haze which spreads over the line from the cursor to the end of line and when moving through coloured squares that is extremely difficult. Even when switching-on the computer, the normal inverse "K" cursor is invisible and the only thing the user will see is the blank red screen.

If when switching-on the ZX-81 you get only a blank white screen there is a small resistor inside the unit which can be adjusted to give colour on the screen. That is done easily with a small screwdriver.

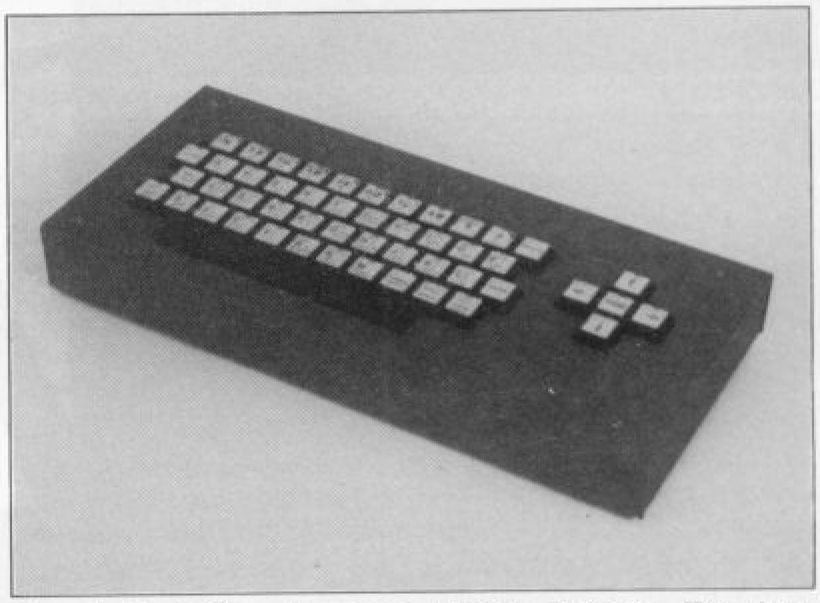
The other control inside the box allows you to set shades of colour towards more red or green.

The plastic box is very well made and is fitted like a jigsaw, with no screws, and so can be taken apart and put back together without damage, if with a little difficulty.

The system is very easy to use and fitting it could be much simpler if clips were provided. That would eliminate having to solder wires to fit it on to the video wire going into the modulator.

All the other connections are made by plugging the edge connector of the box into the expansion edge on the back. It can be used with or without a 16K RAM pack but will not work with devices using the upper 32K of memory space. It should certainly put life back into ZX-80s and ZX-81s and is available from ECC Publications, which publishes *Sinclair User*, for £32.90.

Motherboard for the serious user



MICROTEXT U.K. has launched a motherboard, power supply and keyboard unit for serious users of ZX-81s and Spectrums. The keyboard has the normal 40 keys, plus an extra shift key, DELETE key, an extended mode key, a SHIFT LOCK key and joystick-type control pad.

All the keys are approximately ½in. square and have very little space between them, which makes it easy to hit two keys at a time.

The keyboard has a case which is an optional extra. The ZX-81 or Spectrum PCB will fit inside it comfortably but you will not be able to use it with the Interface One.

The motherboard connects to the computer via an edge connector connected to a bundle of wires. The motherboard PCB card provides one unbuffered edge for any Sinclair or other equipment, but all the cards are operated through the buffers. A power supply can also be purchased which fits on the back and will supply the computer, as well as supplying +12 and +5 volts at 5 amps each for the extra cards.

The units are expensive and require the user to have considerable technical knowledge. The brief explanations provide a sound base for school and industrial development projects. The keyboard costs £41.95, the case £11.50, the card frame £36.95 and power supply £36.95.

Microtext calls the system Mukbus and it is based on Eurocard-standard 64-way DIN connectors.

Microtext is at Highland House, 18-24 John Street, Luton, Bedfordshire LU1 2JE. Tel: 0582-418819.

Room for improvement

THE CPD8300 tape recorder is designed to replace the Ferguson recorder as a standard tape recorder for personal computers. The main difference is that it has been designed as a data recorder — although it can still be used for speech — and has a switch at the back marked Spectrum. It runs from 240-volt mains only and has a power ON/OFF switch and power-on LED.

It also has a number of extra facilities which should have made it easier to use with the ZX-81 and Spectrum.

There are sockets at the back of the recorder marked REMOTE, SOUND IN and AUX. The AUX socket is designed for high-level inputs to the recorder but unless it was used for the Spectrum it could not record properly.

The powerful amplifier built into the tape recorder — 400mw — is the biggest cause of the problems in using the tape recorder. The volume control and level meter are not accurate enough to allow you to set up the correct SAVEing and LOADing level.

The level should be 7–8 when SAVEing and between 4–8 when LOADing, depending on the computer. The entire range of the level meter appears between two and three on the volume control when LOADing. There are 10 sections on the volume control and it would have been better if a second fine-tuning volume control had been incorporated.

On SAVEing, the Spectrum MIC lead had to be plugged into the AUX socket to register on the meter and the ZX-81 input had to be adjusted at about 5 on the volume control using the SAVE socket.

Once the correct levels had been achieved it was easy enough to SAVE and LOAD but they had to be changed to VERIFY a recording. The level meter is undamped. It is too easy to overload it and when SOUND is used on the speaker switch, the needle shakes violently. At £39.95 the recorder appears overpriced, although W H Smith has promised modifications.

Bug tracer a useful addition

FOR MANY ZX-81 owners it would be a welcome relief to have a program to indicate exactly what was going wrong in a program just typed into the machine. Now all that is possible with **Trace,** a utility for the 16K ZX-81.

The program has been written in machine code so it will load above RAMTOP. You can then type-in your Basic program as usual and run it for any errors which may occur.

If the program stops with an error code you can use Trace to look at the structure of the lines running up to where the program crashed.

To trace through a program you have to call the utility using either a direct machine code invoke command or using a call in a program.

Invoking the utility in a program has the advantage that you can trace through a few lines which occur in the middle of some code.

When Trace is invoked you should see the number of the line which is being executed displayed at the bottom of the screen and the effects of the program line on the rest of the screen.

In that way you will gain a better understanding of what each line is doing and how it fits into the structure of the rest of the program.

Trace is an excellent utility which provides a useful addition to any ZX-81 owner's programming library. You should find it helpful in dealing with bugs in any Basic program.

Trace can be obtained from Texgate Computers Ltd, 14 Brook Lane, Corfe Mullen, Dorset BH21 3RD. It costs £5.95.

LOAD-SAVE routine saves considerable time

ONE of the factors against buying a ZX-81 is the time it takes to load a 16K program. The **Fast Load Save** routine from Musamy, for the 16K and up to 64K ZX-81, will speed the rate of saving and loading considerably.

The program will load at varying speeds, as some tape recorders cannot cope with the accuracy needed in conveying baud rates of up to 4,800 to the ZX-81. The baud rates available using the fast load routine vary from 2,400 to 4,800 on a scale of one to ten. That variable baud rate can be changed if you buy a more sensitive and more expensive tape recorder.

The routine will also give you a verify routine such as the one used on the Spectrum. That means that once you have SAVEd a program on tape you can verify the tape copy with the original before doing any NEWing. It means you can re-save the program without having to type it in again.

Also included on the tape is a tape loading aid. It acts as a companion to the Fast Load Save and will help you to test playback levels on your tape recorder. It will also test how 'noisy' the recording of your program is.

Fast Load Save is available from Musamy Software, 11 Brettenham Avenue, Walthamstow, London E17 5DG. It costs £6 for both the loading aid and the Fast Load or £3 for only the loading aid.

Keys work against text processor

WORD PROCESSING is very difficult on the ZX-81 but that has not prevented Contrast introducing **Text,** a word processor for the 16K machine.

It is written in 100 percent machine code and, as a result, works extremely fast. It is unfortunate that it does not make the computer adequate for word processing. The keyboard still remains almost impossible to use as you cannot tell whether a key press has been successful.

If you are willing to tolerate those inherent difficulties, you should find Text to your liking. The program includes all the usual text-editing facilities, including justification on the left and right, block move, search and replace text, and delete.

It will enable the user to store up to 350 lines of text—approximately 11,000 characters using the limited ZX-81 upper-case lettering.

The program has a help option and everything is included to make the reader at home with the program. It is unfortunate that the software is confined by the hardware.

Text is available from Contrast, Farnham Road, West Liss, Hampshire GU33 6JU. It costs £5.95.



Speed main attraction

THERE ARE few companies still selling 1K ZX-81 games and Selec Software is one of them.

The programs may not be anything special but the way in which they are fitted into the 1K memory space must be praised.

Two of the best cassettes in the range include 1K **The Invaders** and 1K **ZX Panic/ZX Squash.** All the games on both cassettes are in machine code and their speed is the main attraction.

The Invaders is a typical game of space invaders. You have to hide beneath your three laser bases and, when you can, get as many laser shots as possible at the enemy invaders.

The control keys are a little awkward to handle but once you are used to them there should be no difficulty about enjoying the game to the full.

Panic is a target-shoot game in which you have, yet again, to bag as many aliens as you can. The game can become a little tedious after about half an hour of continuous play but if you want to play something else you can change to side two of the cassette and play ZX Squash.

That involves two players who must take turns to hit a ball against a wall.

If you do not like the idea you could always imagine that it is a two-player version of Breakout.

Both tapes can be obtained, for £3.50 each, from Selec Software, 37 Councillor Lane, Cheadle, Cheshire.



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Turk's chess a delight for players

PIT YOUR WITS against an emissary from the past. This is no space invader but an automaton called the Turk who will give you a good game of chess.

Chess — The Turk is for the 48K Spectrum and contains many options which are unusual in chess games for the computer. Before you play you can see how good the Turk is by watching the program play against itself. Levels of play range from one to six and will take a few seconds on level one to six hours on level six.

If you are an average good player for your age you may care to try level two, or perhaps three at most, as they will give you at least some chance of winning.

If you have been adept at the game for some time you might like to take on the program at **Blitz Chess.** The name is apt as our board looked like a map of London after the war in just 20 minutes of torment. The reason is that Blitz Chess is against the clock.

The game will allow all legal moves, including *en passant* and pawn promotion. It also allows you to switch sides during the game or, if you want to cheat even more, remove the Turk's queen from the board.

Chess—the Turk is well-packaged. It can be obtained from Oxford Computer Publishing, PO Box 99, Oxford. It costs £9.95.

Handy quill opens-up adventure games

ADVENTURE games have always proved a popular part of the Sinclair software market but until now it has proved almost impossible for a user who knows little about computer programming to write one.

That has changed with the introduction of **The Quill,** an adventure game utility for the 48K Spectrum. The program will allow you to design an adventure game, complete with dungeons, monsters, items and treasures. It will then compile all the information into a machine code file. That means the game you obtain finally from the program will be in machine code. If that is not good enough the machine code game can then be loaded independently of The Quill program.

Each adventure can be different from the last and they can be made as easy or as difficult as your imagination will allow. With the utilities available in the package you can create a dictionary of words specific to your needs. Of necessity they will usually be a verb followed by a noun.

The package is backed-up with a well-structured manual which starts with the simple concepts of creating an adventure with The Quill. It then goes into detail about how the package is structured.

The author does not seem to be concerned how much the user knows about the package. As a final note the manufacturer does not mind if adventures created using The Quill are sold commercially by their creators. It would, however, like to be mentioned on the cassette inserts and the program.

The Quill opens a wide area of activity to people who have always wanted to write adventure games. Now all you have to do is provide the story lines to make them interesting. It can be obtained from Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan and is inexpensive at £4.95.

Inscrutable journey

XATRO is a cunning devil. He left seven parchments on **Invincible Island,** ready to be found by an aspiring adventurer. To find the scrolls you have to climb mountains, enter a walled area which looks like China and descend to the bowels of the earth.

Those locations, and many others, are displayed with colour graphics on the top half of the screen while the instructions which you give



the computer — the descriptions of items found along the way — are displayed as text at the bottom.

The initial stages are easy and give no indication how difficult it becomes when you hit the wall of 'China' or find your first scroll. Our inclination, after wandering around for some time without much hope or help, was to concede but suddenly events took a drastic change for the better — we found our second scroll.

The infuriating thing about Invincible Island is that just as you are ready to commit suicide and pull out the plug in desperation the problem facing you resolves itself and the adventure takes an upward turn.

Invincible Island graphics and storyline should keep everyone happy for several hours. It costs £6.50 and is available from Richard Shepherd Software, 23-25 Elmshott Lane, Cippenham, Slough, Berkshire.

Gazing at signs of character

THE DEPTHS of your mind and personality will be probed with **Star Gazer,** an astrological program for the 48K Spectrum. All it requires is your birth-date and time, together with the longitude and latitude of birth. It will then provide a horoscope designed with your natal data in mind.

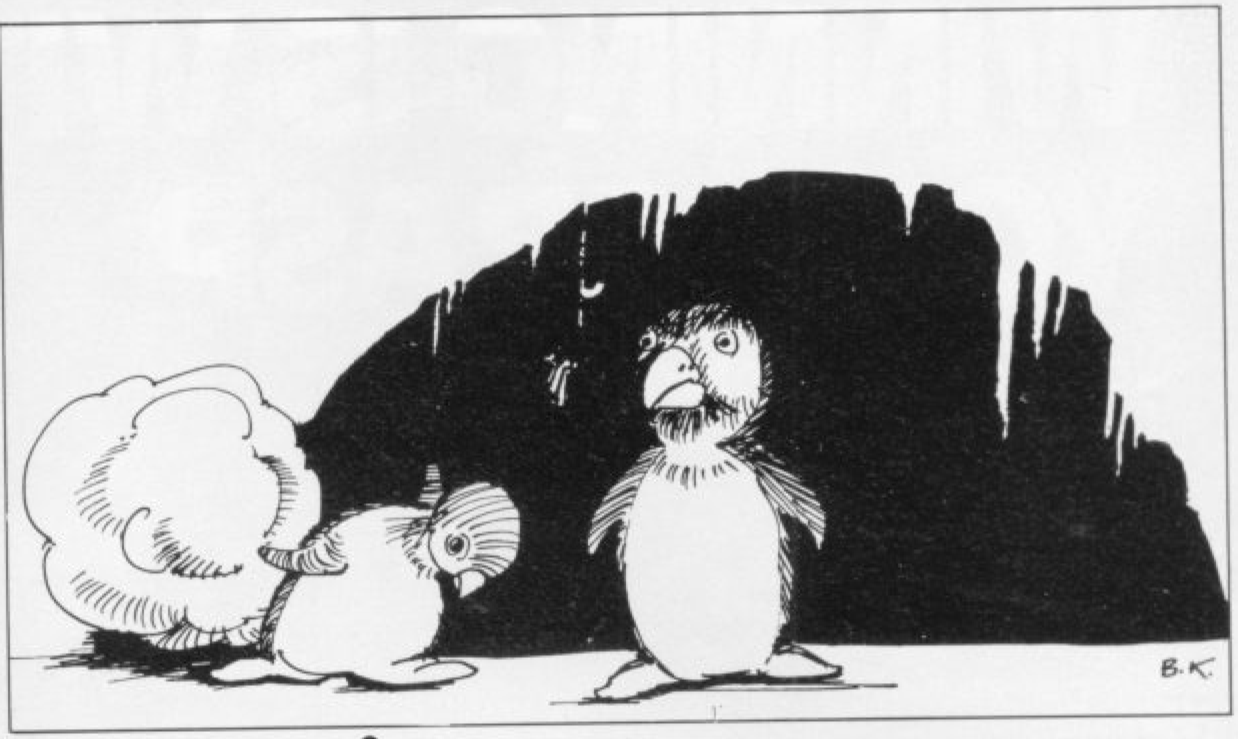
The computer will ponder the data for about two minutes and then draw a chart with all the planets in the relevant signs of the Zodiac and the houses, calculated using the Equal House system, around the circular rim of the chart. It will then give you a character reading depending on which planet is in which house of the solar system. Each house is taken in turn and by the end of the reading you should know things about yourself which you did not know previously.

Several readings were done in the *Sinclair User* office and when compared they seemed to be very similar. The readings were general in description of personality types, so that everyone found something in them which was true.

If you are a novice at astrology and want to learn more, the program will give you the opportunity at the end of the personality profile. If you select the option for more information it will tell you how to interpret the chart and where to obtain more details about the subject.

The package is very comprehensive and was written by a member of the Astrological Association. If you want to know more about the occult side of your nature, it draws a good horoscope.

Star Gazer can be obtained from Computer Rentals at 140 Whitechapel Road, London E1 1EJ. It costs £5.95.



Inventive caverns deserve more success

MUTANT telephones, killer penguins and caverns of ice are all part of **Manic Miner** for the 48K Spectrum. The game includes some impressive graphics routines which you will encounter when you take your player-character, Willy the miner, through a series of caverns inhabited by all kinds of strange creatures.

To exit from a cavern you have to pick up a series of keys hung from various parts of the ceiling or from bushes which are deadly if you touch them. To reach those keys you must jump on to ledges which are situated at various heights and you must jump in the correct order or you will fall back to earth again.

If you are not careful you could bump into a patrol robot, shaped in various guises, which will take away one of your lives.

The other killer is a fall from one of the ledges which disappears as you walk along it. If the ledge is high a life could be lost.

The game is very inventive and a great deal of thought must have gone into creating the many screens full of colourful characters. It is one of the few games on the market which deserves to succeed automatically because of the effort put into it. It has the depth of concept and quality of sound and vision to make it an instant winner.

If you cannot pass all the caverns and discover the secret of the game in the last sector the author has included an excellent taster routine which runs automatically at the start of the program. It shows the various caverns as they can be seen in the game.

Manic Miner should keep anyone, child or adult, enthralled through the long winter evenings. It costs £5.95 and can be obtained from computer branches of W H Smith.

Fighting enemy robots can affect your health

THE ARENA is filled with hostile robots as you, the last of a race of fighting robots, battle for your life. In **Spectron,** for the 48K Spectrum, your laser gun is on automatic and will fire as you move. With luck — and just a hint of skill — you should be able to destroy the enemy and prepare for the next battle.

The game sounds simple so far but in playing you have to take account of a number of factors which will affect your health, such as energy. You also have to tolerate a potential score which seems to get higher and higher.

Virgin Games, the manufacturer, has some accurate figures on the statistics of the game. You can have up to 54 robots and missiles on the screen at once, which is not good news for the lone survivor of a race of tin cans. It is, however, surprisingly easy to pass the first levels without too much trouble but after that the evil robots could gain the upper hand, or claw.

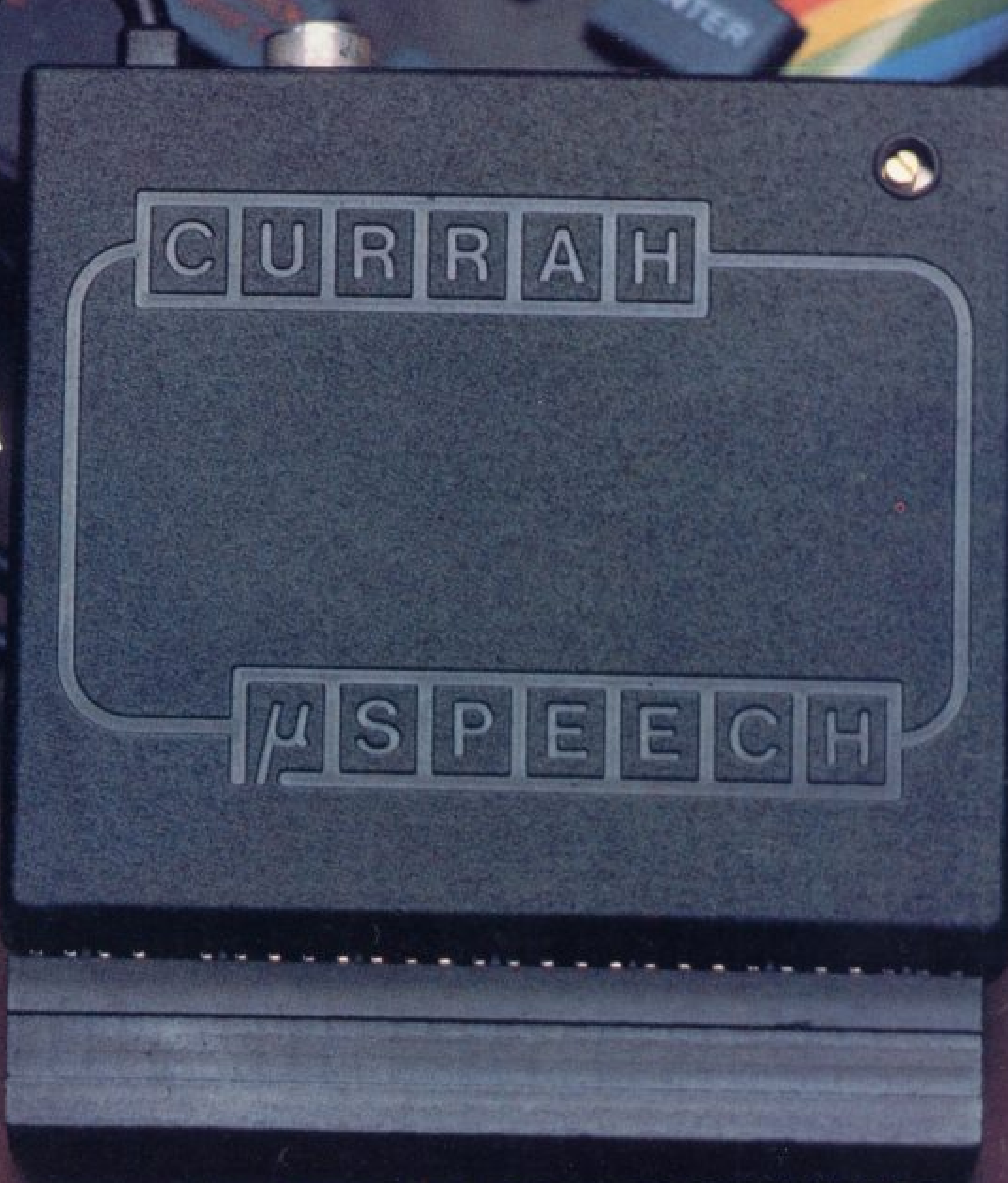
If you play the game for long enough you will become addicted. It is simple but you will always want to reach one level higher every time.

Spectron is produced by Virgin Games and can be obtained from Boots, Menzies and Dixons. It costs £5.95.

More software page 52

SPEECHLESS??

Micro Speech lets ZX Spectrum talk!!



- **JUST PLUG IN AND USE**
  Micro Speech is easy to use — simply plug into your Spectrum and TV and enjoy a new dimension; instant voicing of all the keys .... infinite vocabulary at your command .... intonation to add character to speech .... exciting new range of sound and speech games ....
- **IT'S AS EASY AS THIS!**
  LET S$= "me(rr))EE) krismus" will say "MERRY CHRISTMAS"
- **QUALITY SOUND**
  Micro Speech talks through your TV's loudspeaker, ensuring top quality sound.
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Corridors of 3-D power

THE CIRCULAR corridors of the computer installation based on Genon hide a dark and deadly secret. They are inhabited by a creature called Bogul. The creature and its cloned counterparts will try their best to stop you reaching the main computer, cracking the secret code and returning to the outside world before the base explodes.

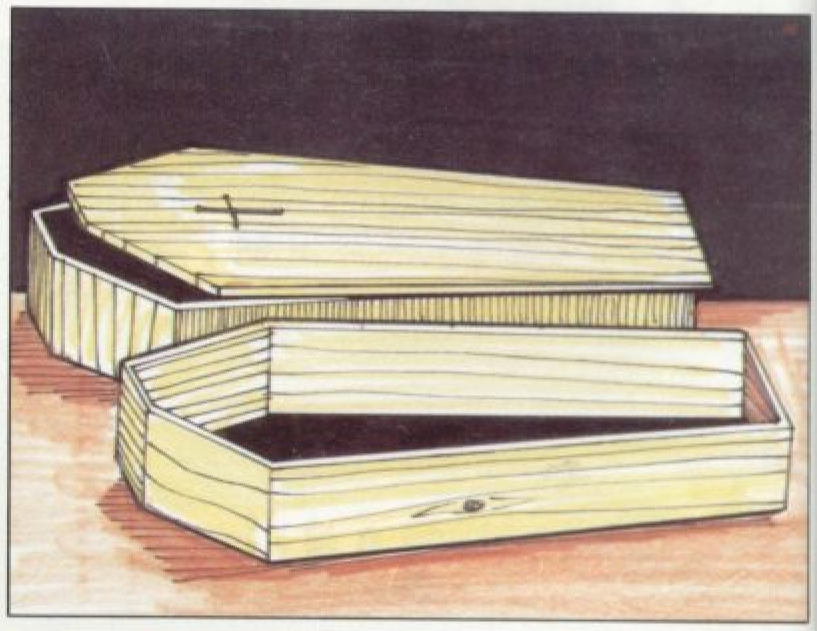
Corridors of Genon, for the 48K Spectrum, is in a long line of 3D games from Malcolm Evans and New Generation. It is set in the usual maze but the unusual thing is that the corridors are circular. That effect works well and is added to by the sliding doors which lower from the ceiling to block your way. Depending on the level at which you are playing you will be given either the pass number of the door to make it open or you will not.

The most difficult part of the maze is the centre, at corridor 30, where doors are closing all the time, pass codes are hidden, and you can hear Bogul's footsteps getting nearer.

When finally you beat corridor 30 you will be introduced to the computer. In that room you have to guess the destruct sequence code of the computer. That is such an important part of the process that when the program is first loaded, and before a new game begins, you will be asked if you want decoding practice.

Once you have cleared the code the computer will tell you that all is well but that Bogul has multiplied and there are then several of the trumpet-nosed creatures wandering the maze. Before the game ends you must pass all of them and get out of the maze.

Corridors of Genon is an excellent 3D game from a master of 3D techniques. We cannot recommend it too highly. It costs £5.95 and can be obtained from New Generation, Freepost, Bath, BA2 4TD.



Effective display

ARCADE GAMES on the 48K Spectrum are still all the rage but it is difficult to find one to better the original. That is the case with **Invasion of the Body Snatchas** from Crystal Computing.

The name of the game may be different but the concept is still that of Defender. You must pilot your spaceship left and right over the alien landscape, shooting-down aliens, avoiding mutants if possible, and rescue refugees from certain death.

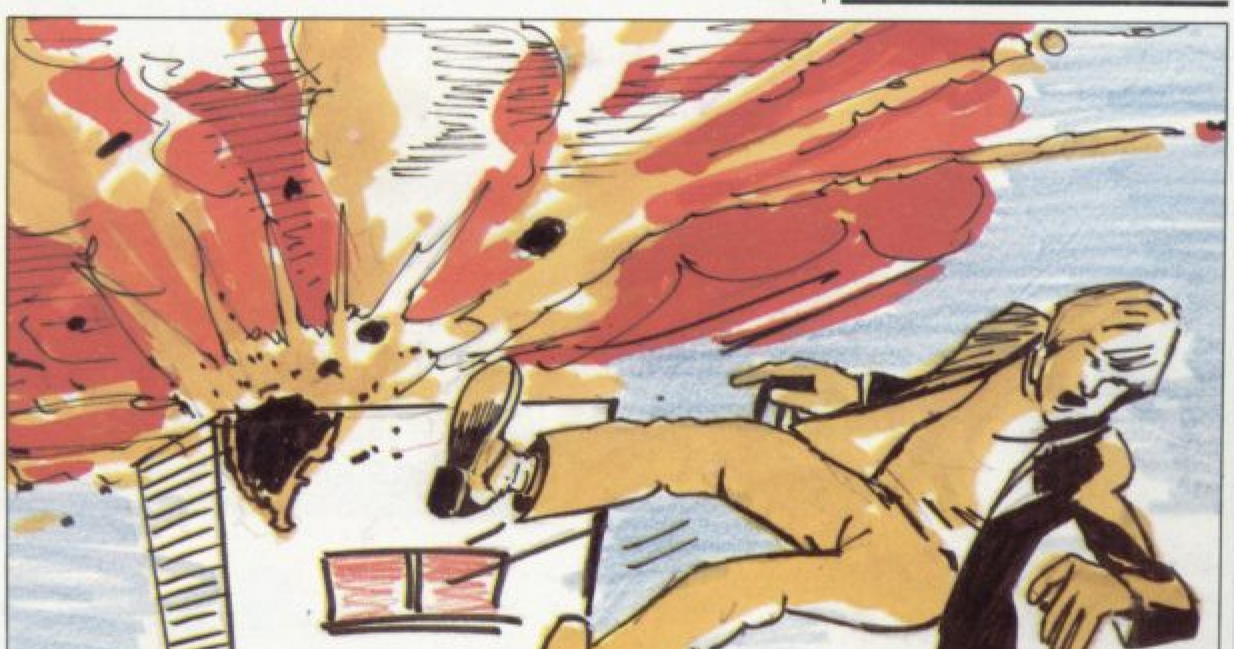
Sex equality has finally reached the Spectrum as the refugees are women as opposed to the men of the original. That is not the kind of equality most people have in mind, though, as the women are dropped from staggering heights.

The screen display is effective and, if you were to put the computer under the table, you would not know the game was running on such a small machine.

This time Crystal has added sound and it is very effective. You can, however, access the buzzing and zapping noises only through a Fuller sound box. That is not a deficiency in the program as, with the type of sound being created, you would not be able to gain a true appreciation through the tiny Spectrum speaker.

If you are sufficiently clever and quick-witted you will gain entry into the Hall of Fame. The high-score table is sure to gain notoriety as the program will trap certain names and phrases typed into it and output messages from Crystal Computing. It was distracting trying to find the names which put up the messages, though it was nearly as enthralling as playing the game.

Invasion of the Body Snatchas is an essential buy for all arcade fans. It can be obtained from Crystal Computing, 2 Ashton Way, East Herrington, Sunderland SR2 3RX.





The same game—only the aliens are different

MOST YOUNG 48K Spectrum owners dream of being able to write a prize-winning machine-code arcade game. The dream can be a reality with **Games Designer** for the 48K Spectrum from Quicksilva Software Studios.

The package will enable you to build various game elements into the game of your choice. You can design large animated characters, called sprites, and make them into spaceships, witches, demons, or even mutant hamburgers.

Once you have designed the characters you can decide their movements with the attack wave designer. With the aid of this tool you can make the game as difficult or as easy as necessary. Explosions, zaps and even spaceship engines can be manufactured using the sound generator. It can be programmed to take effect when an alien or laser base is hit.

To manipulate games you need no programming experience. The disadvantage is that the games you create will not run independently of the Designer program. You have to load the main program and select the game load option to play back the program you have created.

Although you can create a variety of games, with aliens appearing from the sides, top and bottom of the screen, the types of game will seem finally to be all the same. In effect all you are doing is zapping aliens and there is no change to the format.

To become used to the package you might like to try one of the eight games included on the new game menu.

They include Attack of the Mutant Hamburgers, Hallowe'en and Reflectatron. Most of them will provide a certain amount of fun but many of them just emphasise the point that they are the same games but with different aliens, moving in different attack waves.

If you want to program games with no programming knowledge, Games Designer is for you.

It can be obtained from Quicksilva Ltd, Palmerston Park House, 13 Palmerston Road, Southampton, Hampshire SO1 1LL. It costs £14.95.

Breaking with tradition

ORACLE'S CAVE, for the 48K Spectrum, hints at the way in which adventure games might develop in the near future. It is a graphics adventure but like nothing which you have seen previously. The screen is split into two parts and the scene is set in a matrix of caverns. The caves and your player-character are shown in silhouette and when you want to move around, the cave system will scroll in the direction of movement and the player will walk or climb.

The screen display also includes a chart showing the level of your energy and combat strength, together with the weapons, items and treasures you have found. Each quest is selected by you at the beginning of the game and you will have five game days in which to complete it. The time factor is exceptional in adventure games.

Oracle's Cave breaks away from the traditional concept of adventure gaming. It provides moving graphics displays which enable you to imagine the situation in which you are playing as if it were real.

One criticism, however, is that the command words are shown throughout the game. Unlike other adventures they are not hidden for the player to find. If you want to find a keyword you will often have to refer to the textual instruction on the cassette insert. For instance, k stands for key and r for rope. Memory restrictions may have interfered with putting more into the program but it would have been better to include explanations of words on the screen.

Oracle's Cave can be obtained from Doric Computer Services, 3 Oasis, Glenfield, Leicester.

More software p54



Screen artists can be fast on the draw

MELBOURNE DRAW program for the 48K Spectrum gives you a utility which permits the sketching of pictures on the screen using a cursor. The pictures can be saved, loaded and manipulated using this design aid.

The program will also enable you to create graphics and characters in your own programs.

When first loaded the ease of use of the package is not apparent. You are faced with a long menu and, when you select the edit picture mode, you will be faced with a black papered screen and some status words below.

Before you can start drawing you must clear the screen paper so that it is white. Then, according to the 20-page manual with the cassette, you should see a cursor near the middle of the screen. The manual fails to inform you, however, that the cursor is only one pixel wide and if you wear spectacles you may take some time to hunt for it.

Once you have drawn a picture you will be able to manipulate the result.

You can change attributes, flash various parts of the screen, invert parts of your picture, and scroll parts. Once you have finished you can save the result on to tape.

The impression we gained from looking at the booklet and the material written on the back of the display box was that the fantastic graphics which you can create, if you are clever enough, can be used in your own programs. That produces visions of little animated figures which make up the main part of your games.

The only real benefit we could find was to put SCREENs at the beginning of the games. That could be done just as easily by writing a program to draw a design and then SAVE it directly. Admittedly the magnification, scroll, flash and attribute options are useful but if you are designing a screen you can do without them.

Melbourne Draw may be of interest to artists or professional software houses who want quick graphics results. It can be obtained from Melbourne House, 131 Trafalgar Road, London SE10. It costs £8.95, which is expensive for such a utility.

Ultimately endless

MOST GAMES for the 48K Spectrum boast that they will show you the answer to all your prayers, the answer to the ultimate question, and **Pyramid** is no different.

The difference is that during the game you must play a cosmonaut who is seeking the real answer to the ultimate question of life, the universe and everything, which was formerly thought to be 42.

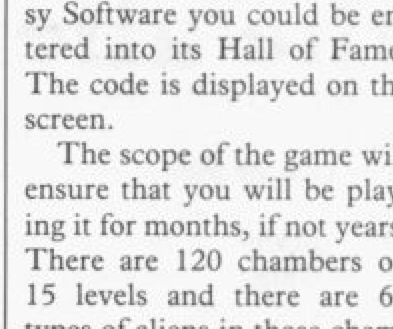
To do this you have been zapped into a pyramid of many levels and chambers. As you gain entry to each chamber you are one step closer to knowing the answer. All that stands in your way is the many creatures and objects which inhabit the dark corner of the pyramid.

You must clear each chamber before you pass to the next and the speed at which you do so will make points. The more points and experience you amass the bigger your code will become.

The code is the manufacturer's way of checking how far you have advanced in the game. If you send it to Fantasy Software you could be entered into its Hall of Fame. The code is displayed on the screen.

The scope of the game will ensure that you will be playing it for months, if not years. There are 120 chambers on 15 levels and there are 60 types of aliens in those chambers. Most of the beasts defy description.

Pyramid costs £5.50 and can be obtained from Fantasy Software, Fauconberg Lodge, 27a St Georges Road, Cheltenham, Glos GL50 5DT.



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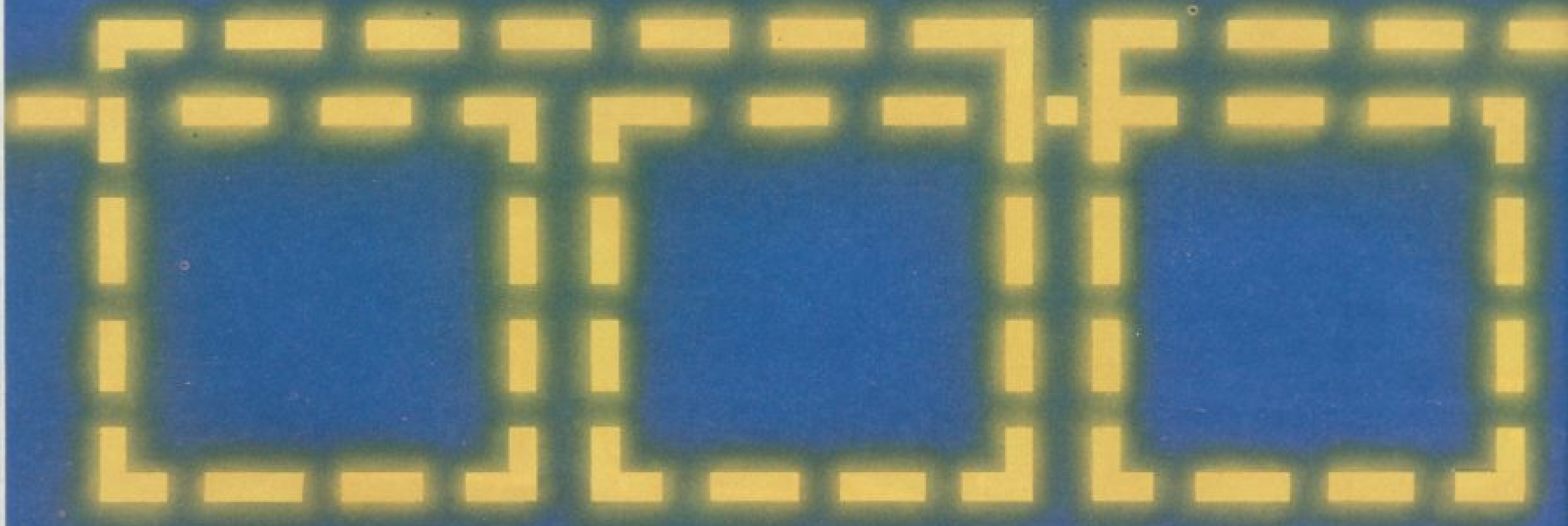
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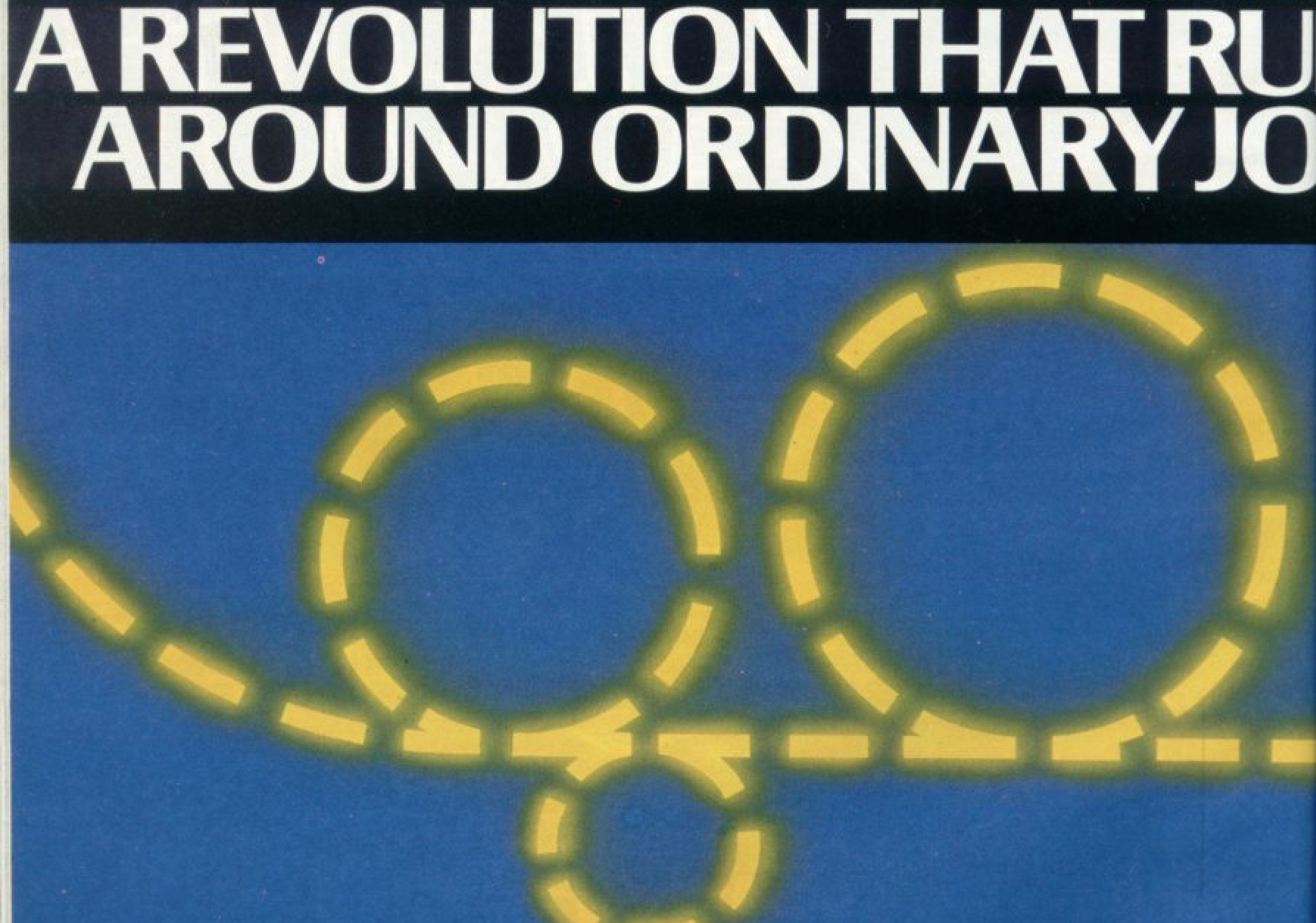
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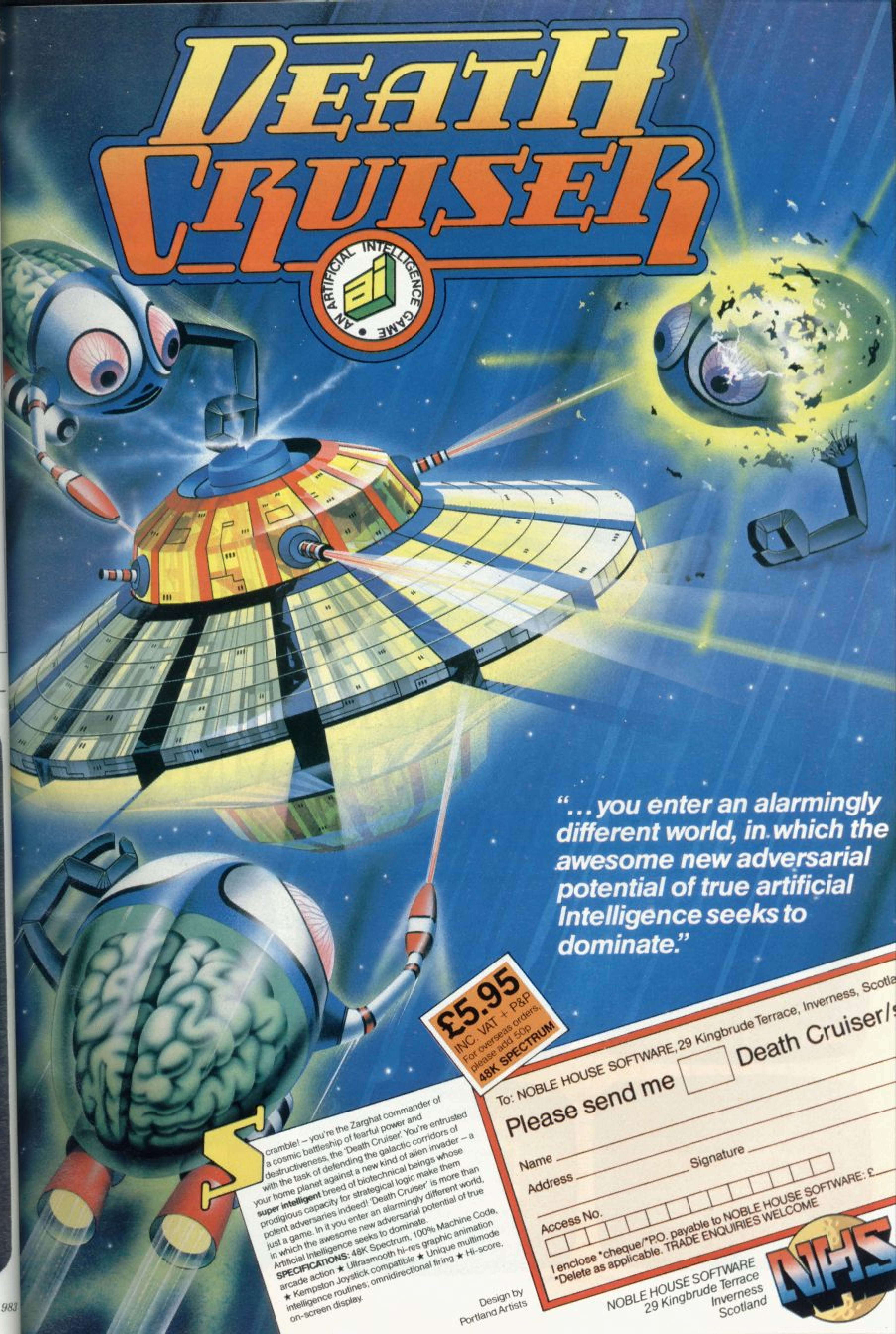
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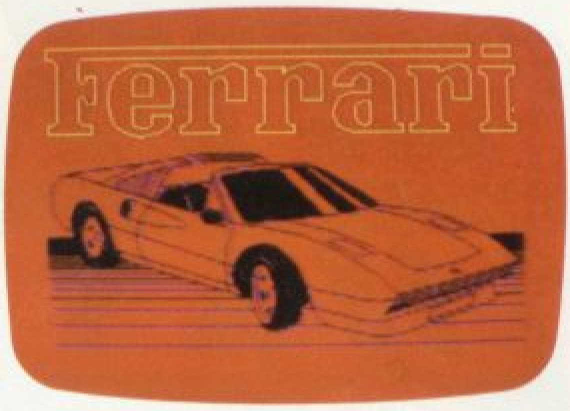
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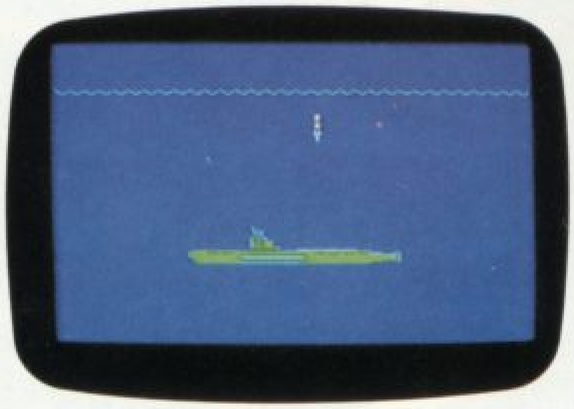


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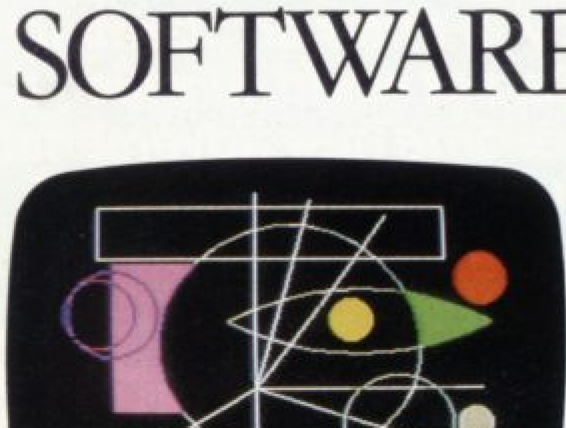


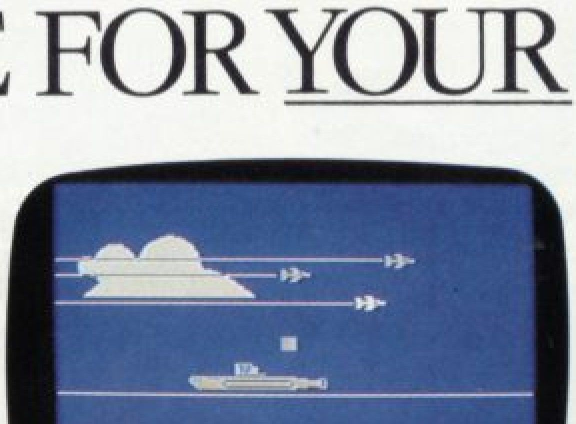
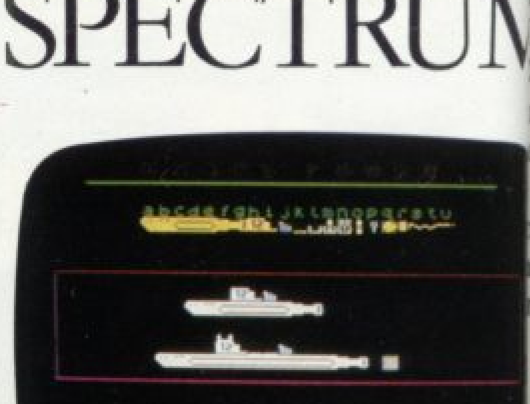







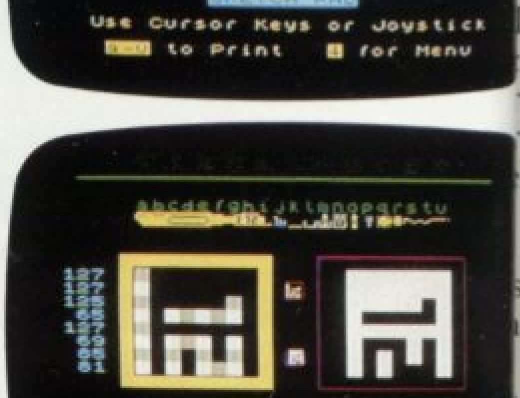

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New companies on the Sinclair bandwagon

John Gilbert looks at the latest additions to Sinclair Research's growing software library

SINCLAIR RESEARCH seems to have its eye on the rest of the software market, something which it was loathe to do two months ago. It has opened its software range to such an extent that new and smaller companies, other than Artic Computing and Melbourne House, have had a chance to enter their programs into a range which already includes such programs as The Hobbit and the Artic range of adventures.

The new companies on the Sinclair Research bandwagon are Crystal Computing and Ultimate Play The Game. Crystal Computing has sold its **Zeus Assembler** and **Monitor Disassembler** to Sinclair. That means it at last has two machine code utilities, for the 48K Spectrum, in its range.

The Crystal Zeus Assembler is one of the best of its kind and provides excellent facilities for beginners and experts alike. Writing assembly language using it is almost as easy as writing Basic code. Each line of source assembly code is indexed with a number, just as Basic instructions are indexed with line numbers.

All the features which are found usually on assemblers have been included. Labels and expressions can be included within source code and strings of symbols can be entered into memory tables using the utilities in Zeus.

One of the advantages of Zeus is that you do not have to include an ORG instruction with the program to indicate to the computer where to put the object code when it has been assembled. If you omit the ORG instruction the computer will allocate the code to a space in memory.

The problem with Zeus is that you have to exit from the assembler to save the code which has been generated. If you are a beginner that can be a lengthy and nerve-racking process and you have no guarantee that you can load the code back into the computer.

Apart from the lengthy preparations for loading and saving, the assembler is still one of the best on the market. It is a pity that Sinclair Research has put it into a colourful box to justify a price rise of approximately £4. The box may look pleasant and it may improve the quality of the product on the shelf, from a commercial point of view, but the box will not help you to program.

The same is true of many of the other programs in the range. The boxes do not add anything to the product once you have it at home and paying up to £4 extra for packaging is unlikely to go down well with most customers.

The Monitor and Disassembler for the 16K/48K Spectrum is from Crystal and the price of the product has also been increased substantially. It can be used with the Zeus Assembler and will provide a disassembly of source code from your machine code programs or from the Spectrum operating system in the ROM of the machine.

> 'Flippit has been put on a parallel with the Rubik Cube. It certainly is a maddening puzzle and almost impossible to master completely'

The Monitor will also enable the user to assign values to the CPU registers. That means that values can be set to test machine code programs and to see how they run under certain conditions. Machine code routines can be copied from one part of memory to another and the routines can be edited in hexidecimal using the Monitor. One other useful function is to convert a hexidecimal value to decimal and vice versa when you are using the editing routines. That saves a number of calculations on paper.

The Monitor and Disassembler is the perfect companion to the Assembler but at a combined price of nearly £25 it is expensive.

The next two additions to the Sinclair software library for the Spectrum can both be regarded as mind games. **Flippit,** for the 16K or 48K Spectrum, has been put on a parallel with the Rubik Cube by Sinclair Research. It certainly is a maddening puzzle and almost impossible to master completely.

The Flippit board is like a noughts and crosses grid — it has nine sectors, set out in a three-by-three grid. The computer labels those using the letters of the alphabet, A to I, and numbers or dots fill each corner of each square.

To complete the game you must find the correct combination of numbers so that they add to the same sum horizontally, vertically and diagonally. That means the game is nothing more than the type of magic squares we all enjoyed solving when we were at school.

They can be played competitively and to emphasise the point the moves you have taken so far and the moves which you have to beat before getting the record are part of the board display.

There are three playing options. The first is New Run which will make the computer re-shuffle the numbers on the board into random patterns. The next option is similar to the first and will re-run the last random setting. That means that the order in which the numbers were placed on the last shuffle is restored.

Flippit seems so easy when you first start to play but when you have only two numbers out of place it can become irritating and it is easy to give up, rather than plodding along with the problem. If you are left with the numbers in the wrong places you may have to do a major re-shuffle of the board.

The manual is concise and to the point but includes no information about strategy or play. It tells the player only how to set up the Spectrum and what are the various play options.

One other criticism is that it has no SAVE option for beginners who are puzzlers or who want to break for lunch.

The other mind game in the selection is more of a test of mind power. **The Cattell IQ Test** provides the user with a standard reference to any intelligence quotient. It is the type of test which potential members of Mensa, the organisation whose members have high IQs, must take.

On loading, the computer takes some time to set up the tests. There are six types of logic test which must be taken before the computer can give you an accurate IQ score. Those types include synonym finding, classification, opposites, analogies and inferences.

The results are co-ordinated from the various individual tests to give a percentile overall rating. The Spectrum will tell you eventually whether it is worthwhile applying for membership of Mensa.

After being extremely serious about the validity of the tests, throughout the manual it says in the section about the meaning of the results that the tests should not be taken too seriously and that the tests will not prove that you are a genius. Even if you cannot go around wearing a badge saying 'genius', once you have taken the Cattell test you should have some fun with the package.

Unfortunately the copy we were sent of the tests was tediously slow in producing marks for the various sections and in setting-up the data. Although it looked like a production copy of the package, Sinclair Research says that it is producing a better version of the program.

The final cassette-based program from the library, for the 48K Spectrum, is **Chequered Flag** and it is the only one not in a box. The program is from Psion and it is up to that company's usual standards.

The game sets you as a racing driver over one of the number of world-famous racing tracks, such as Silverstone. You can choose which car you want to use from a visual menu describing a number of well-known racing cars. You can also choose the course on which you want to travel.

The race will take place on the screen, using a three-dimensional representation of the track. Apart from the danger of crashing over the sides of the track, there is also oil on the road surface. At all costs you must avoid the oil or it could cause your car to skid. Once you have been round the track the required number of times, the chequered flag will be raised on the screen and your lap time will be given by the computer.

The graphic and real-time simulation effects produced by the software are reminiscent of the **Flight Simulation** program, also available from Psion through Sinclair Research. There are several tracks and cars to try, so the game should provide hours of entertainment. The quality of the game and the detail included make it one of the great games for the Spectrum.

The quality control and selection of software for the Sinclair software library has certainly increased with the release of this new batch of tapes. The boxes in which most of the products are now packaged are certainly an improvement on the cassette covers which were being used. One disadvantage for retailers will be that display shelves will be occupied more quickly by fewer products. That should be offset, though, by the prices which Sinclair is charging for its new software.

> 'The Spectrum will tell you if it is worth applying for membership of Mensa'

That has already caused murmurs of discontent from customers about to buy software from a company, only to find that Sinclair has bought it and the price has been increased. If Sinclair continues to raise its prices in this way the company could sell less in the way of software and customers may go elsewhere in a large market. That would be a bad move.

The 'L' Game is produced by Quicksilva. It consists of some coloured tiles on a board which are originally in the shape of an 'L' but which the computer manages to mix extremely well. The player then has to slide the tiles back into the correct order to form the 'L' in the least number of moves. It is like doing a jigsaw puzzle with no edges.

Also included on the cassette with the 'L' Game are Mastermind and Pontoon. If you like puzzles, this cassette is good value for money.

Flippit is from Sinclair Research and is a test of logic and arithmetic. The player has to get all the numbers or dots in a square in such a position that the values will be the same when added horizontally, vertically and diagonally. It is a puzzle which you will either love or hate.

The game is like a giant magic square and if you are adept at spotting combinations and have a fast calculation rate you should be able to do the puzzle fairly quickly. So far I have managed to fit the puzzle together with only two pieces remaining out of sequence. The problem is that the instructions are not so good as the puzzle and you could have difficulty in getting started.

Flippit is suited to those people who like IQ tests to learn their so-called intelligence quotient. I think that the only thing IQ tests prove is that a person can do an IQ test but if you want to learn what your rating is you might like to try **The Cattell IQ Test.**

I would be interested to hear your views on this or any other IQ test and also the marks you gained. Do not cheat. The Spectrum is ideally suited to such an application but is the application valid.

I hope that I have provided you with some ideas about the mind games on the market, especially those suitable as Christmas presents. You should not have too much difficulty deciding what to buy even though there is a wide area to cover.

Melbourne House, 131 Trafalgar Road, Greenwich, London, SE10 — The Hobbit.
Carnell Software, North Weylands Industrial Estate, Molesey, Hersham, Surrey, KT12
3PL — Volcanic Dungeon, Black Crystal, The Wrath of Magra.
Sinclair Research, Freepost, Camberley, Surrey GU15 3BR — Artic Adventures A, B, C, D, Flippit.
Quicksilva, 55 Haviland Road, Ferndown Industrial Estate, Wimborne, Dorset — 'L' Game.

> 'If Sinclair continues to raise its prices in this way the company could sell less software and customers may go elsewhere in a large market'



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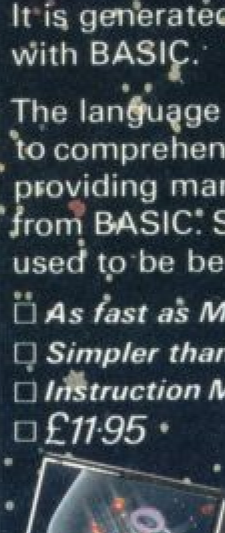
Each command word will write into the program memory the relevant machine code.

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Aiming to speed the response

Stephen Adams looks at the wide range of joysticks that are now on the market

JOYSTICKS are a favourite weapon against space invaders, pirates and in other fighting games. They are also very useful for flight simulation, maze games like Mazog for the ZX-81 or Escape for the Spectrum. That is because they speed the response to the games by up to 300 percent and if the games have been written to obey joysticks, the response to the keyboard has probably made the game run more slowly.

Most work on one of two principles, the commonest being the switched type like the Atari joystick. The other is the proportional joystick, which instead of just indicating the direction of the joystick also sends back a report on its exact position. It does so by giving an X/Y value for the position of the stick in the vertical and horizontal directions. You can write software for those joysticks but no commercial software uses them.

The Atari joystick set a standard by being the first to be used on a video game and since then the style has changed but the connections to the game have not. The Atari joystick has a 9-pin "D" type socket on the end of it which has five pins at the top and four pins at the bottom. They are numbered from one to nine, starting at the top right-hand side — looking at the plug — and only pins 1-4, 6 and 8 are connected. Those pins are connected to five switches in the joystick, one side of the switch being connected to a numbered socket, and the other being connected to a common point, which is connected to pin 8 on the socket.

Operating the joystick in any of the four directions makes that switch operate, connecting the common pin to the socket pin of that switch. The fifth switch is the fire button. Thus only one switch can be operated at a time, plus the fire button. That kind of switch cannot be used directly in place of the keyboard switches, as all the switches are connected together. Therefore an interface has to be used to connect the joystick to the Spectrum without damaging it.

The interfaces are of various kinds but a standard seems to have been set by Kempston, which contacted software companies before it launched its joystick to pursuade them that there should be a standard way of using a joystick on a Spectrum.

That standard way of working has now been written into some of the software by most of the big companies as an alternative to using the Sinclair keyboard.

The software is easier to write if you have only one address to look at or to control. It is also not difficult in machine code to take one byte from an address and check that a switch has operated. It is much easier than scanning the entire keyboard for several different keys.

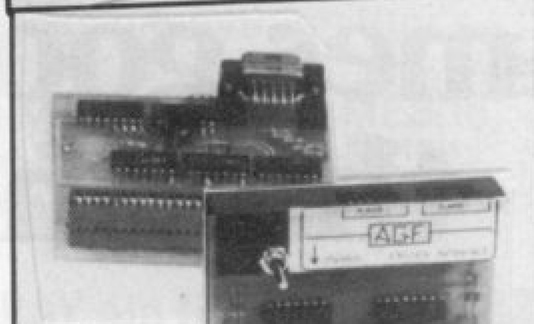
The address the Kempston uses is very simple; it requires only bit A6 to be low using an IN instruction to operate the chip. Address 31 is used to read the value of the joystick. The joystick switches each operate one bit of the binary data returned from the port and as the Kempston Competition Pro joystick allows you to operate two switches directly instead of one — allowing you to go in diagonal directions as well — it is very useful. Only five of the bits are thus used and all the rest are set to 0. If one of the joystick switches is operated, that bit changes to a binary 1 and the number returned will be greater than zero.

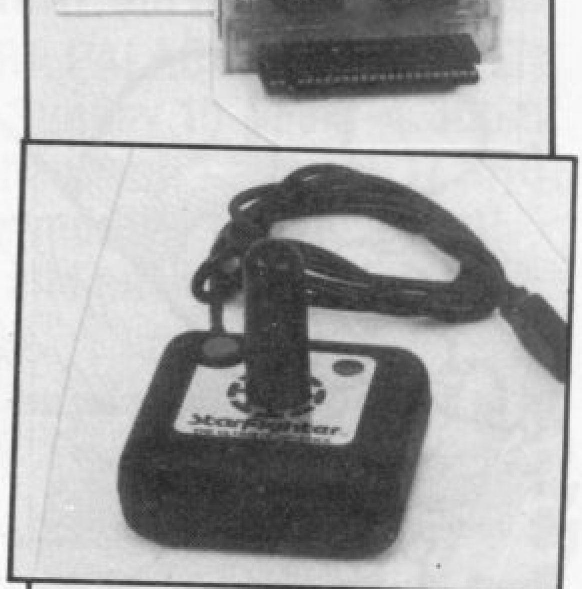
> 'It is much easier than scanning the entire keyboard for difficult keys'

The AGF Interface II allows you to simulate a set of keys on the keyboard but they are fixed to the cursor keys and use 0 for the fire button. It also allows you to use other devices on the back of the joystick and is available in ZX-81 and Spectrum versions.

Unlike the Kempston joystick, which





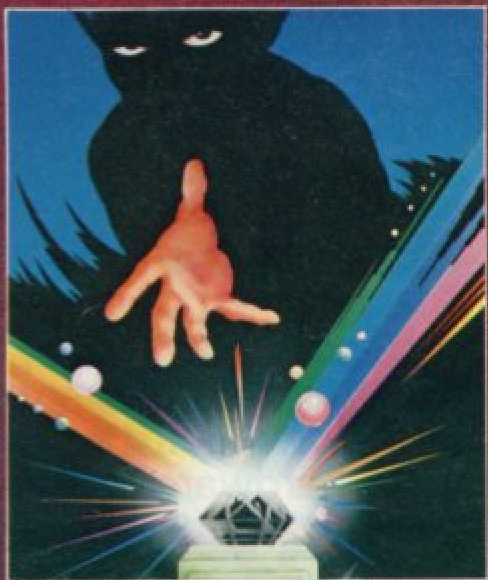






Continued on page 72

JUST AROUND THE CORNER, A NEW R



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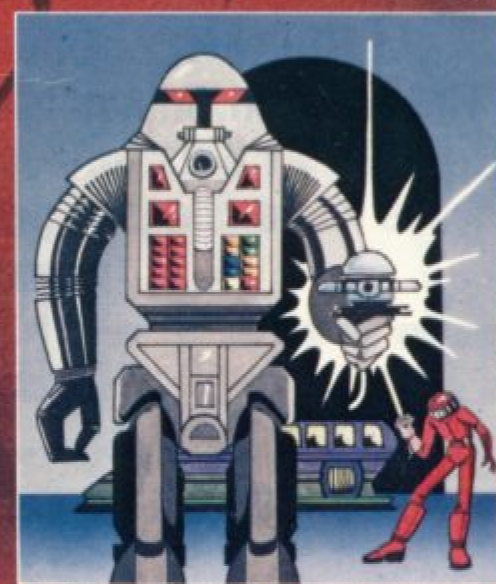
"Alien Intruder/Hieroglyphics — Both programs make good use of graphics a words to make a very entertaining package." (Sinclair User, Aug '82)

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I uttered the last incantations as the clock struck thirteen. All fell silent except a faint rustling in the corner. From out of the shadows they came, all Hell's against me but I was not defenceless until the Angel Of Death, astride a win horse, joined the battle. Avoiding his bolts of hell fire, I took careful aim. chances were slim, but if my luck held . . . 48K Spectrum £5.95.
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Continued from page 67
works on both the ZX-81 and Spectrum with the appropriate software, keyboard interfaces for the Spectrum cannot be transferred to the ZX-81 as not only is the edge connector too big — 28 ways instead of the 23 of the ZX-81 — but the expansion port has different connections.

The Protek is also a cursor-type interface but like most of the interfaces reviewed has no PCB edge to which to connect anything else like a sound board.

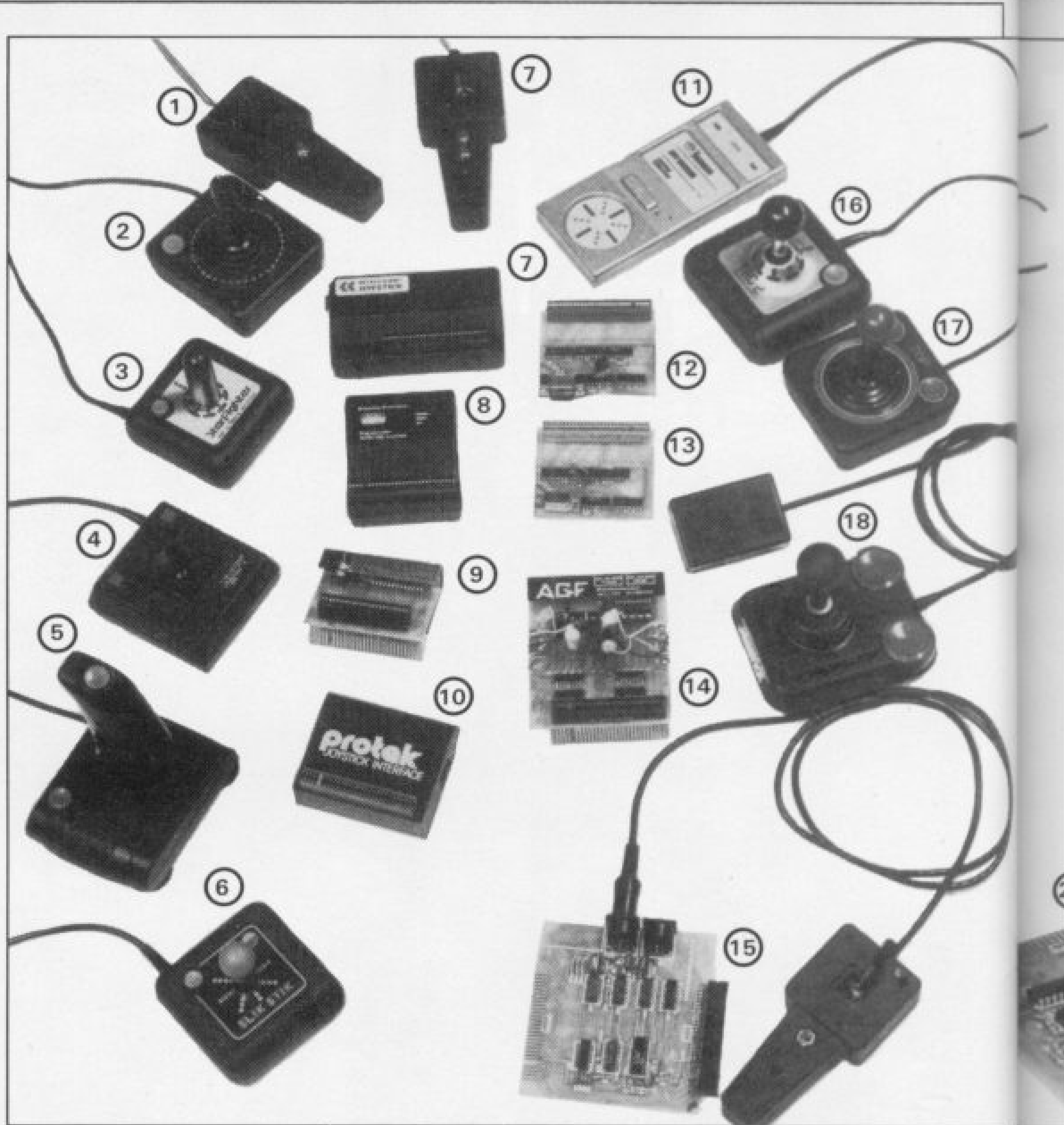
The Jiles Electronics interface is a three-way, bare-board device which can be made to look like that from Kempston, a cursor-controlled joystick, or to work Psion programs. The selection is via two little pegs and is probably the cheapest solution to fitting joysticks, at £13.95.

The Sinclair joystick port in Interface Two operates either the first five or the last five of the number keys. The only software which works with the system is that from Sinclair or Psion.

Soundboards like the Fuller Box and the ZXM from Timedata also have joystick interfaces but use different addresses for them.

Programmable joystick interfaces have also begun to appear for the Spectrum which allow you to program the positions of the joystick to operate different keys on the keyboard. That allows you to operate it with any software, whether it be designed for the joystick or not.

The simplest to understand is the Pickard controller, a plastic box on which there are 40 sockets, one for each key on the keyboard. Five jack plugs, the same type as the cassette leads, are used to program the five positions of the joystick by plugging them into the appropriate sockets for the game.



1 Micropower (Analog) 2 Atari 3 Starfighter 4 Kraft 5 Quickshot 6 Slik Stik 7 Cambridge Computing 8 Stonechip interface 9 AGF interface 10 Protek interface 11 Joysensor 12 Jiles III interface 13 Jile II interface 14 AGF Programmable interface 15 Midwich Analog interface and joystick 16 Tac 2 17 Jiles joystick 18 Kempston joystick and interface 19 AGF programmable interface 20 Stonechip interface 21 Quickshot 22 Midwich interface

At no time is the keyboard disabled. The connection to the joystick is via an Atari socket on the side and the connection to the computer is made by plugging-in plugs to the keyboard sockets inside the case. The power is obtained by plugging the power supply into the unit and then a flying lead is plugged into the computer power socket. It is a very simple and inexpensive way of doing the job and will work for the ZX-81 or Spectrum.

The AGF version also programs it manually by using a set of crocodile clips, one for each data line and one for each address line. It now seems a complicated way of doing things, as it is not as easy to understand as the Pickard, but it does not involve entering the computer. A set of cards is provided to mark the positions of the clips for each game, which seems to prove the point. The unit also tends to be unstable and programming it during a game can crash the system.

Cambridge Computing and Stonechip have employed a different method to program the joystick. They have used 1K of RAM to store the positions of the keys where the joystick should operate. In the Stonechip design you can even have the diagonals operating different keys, giving nine positions.

The Stonechip is also the easiest to operate and has the advantage over the Cambridge in that it will also operate the Microdrive interface, Interface One. To use it all you have to do is push a three-position switch to PROGRAM on the front of the unit and, while holding down the key for that position, operate the joystick. A quick flick is all that is required for each position of the joystick. Then move the switch to NORMAL and LOAD the game.

To use the joystick just switch it to PLAY and the game will respond to the joystick. The review model also disabled the keyboard when in use but the company says a small modification will be done to all the current units to prevent that and will be informing all customers so far as to when to return units for free modification.

The Cambridge unit requires you to LOAD a tape first, which takes you through a menu to program the joys-



tick. If you touch the joystick while LOADing the program, it crashes. It also appears to crash after programming the joystick completely as it NEWs itself to be ready for the next program and that is not mentioned in the instructions — but the joystick still works.

The joystick settings can also be viewed and recorded on tape. The menu program still has to be LOADed first. It has also a rear edge connector so that other things can be plugged-in. The interface is intended to work with the joystick which accompanies it but can still be purchased separately if you want to use an Atari joystick.

The advantage of using your own is that you not only have an eight-position joystick but two independent fire buttons for games at a cheaper price than Atari. Cambridge says it will change software when it can obtain a Microdrive on which to test it.

Electrotech also uses the same system to program its joystick but its interface board is uncased and will work only with its joystick console. The console contains a four-position joystick and three large 1in. fire buttons and looks as if it should belong in an arcade game. It is very robust but costs at least half as much again as the other two.

Joysticks tend to be personal things, so I asked a few friends at a computer club and my children for their options on the range available. The result is clearly for the Kraft joystick, with Cambridge Computing second with its two fire buttons. The Kempston Competition Pro joystick is a good all-rounder with its eight positions.

The others go to show that an increase in price does not always provide easier control. The Jiles Electronic joystick is probably the least helpful, as its stick becomes more like a flexible toy in use. The Atari shows how much joysticks have developed, as it now seems very stiff and unresponsive compared to the newer types.

Atari joystick	Fire	W	N	E	S
6	1	3	8	2	4

9-way socket

Byte returned from Kempston joystick

0	0	0	Fire	S	N	E	W

Joystick Top Ten Chart

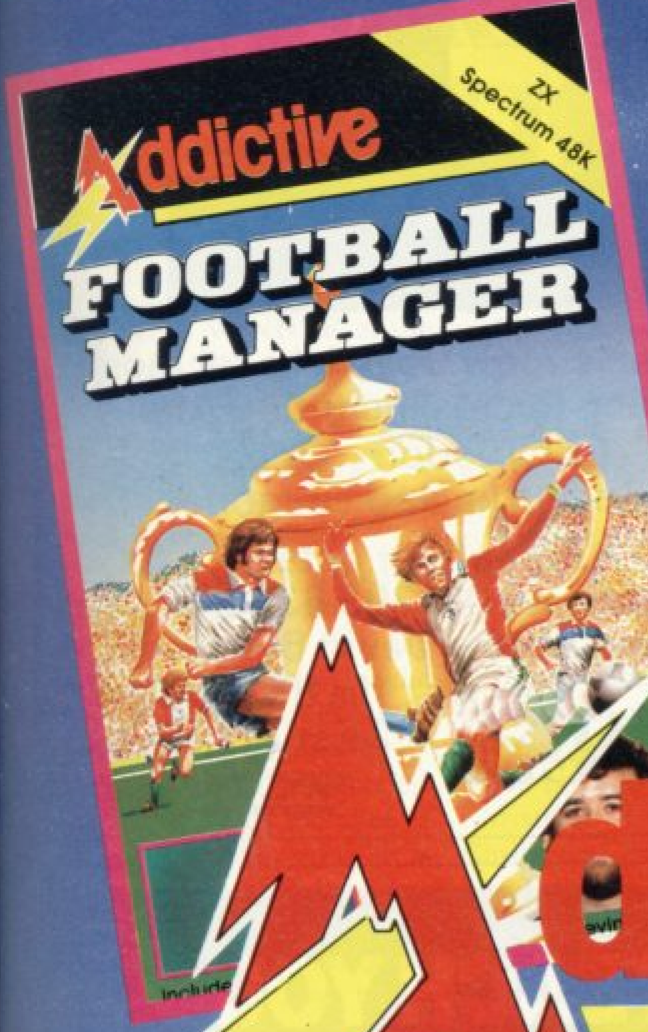
Number	Joystick	Positions	Fire buttons	Cost	Comment
1	Kraft switch hitter	8	2	£18.95	Light, fingertip control.
2	Cambridge Computing	8	2 indep.	£7	Fire buttons may hurt after a time.
3	Kempston	8	2	£14.50	Solid and reliable.
4	Starfighter	8	1	£13.95	Short but easy to use
5	Quickshot	4	2	£12.95	Suckers can fix it to table but a little loose in its action.
6	Joysensor	4 or 8	2	£29.95	Touch-sensitive pads, it takes time to get used to.
7	Slik-Stick	8	2	£9.95	Noisy in use
8	Tac-2	8	2	£18.95	Accurate but may also be stiff.
9	Atari — from AGF	4	1	£7.54	Stiff but inexpensive.
10	Jiles	4	2	£6.50	Bends in use.

Joystick Interfaces

Interface	Programmable?	Cursor	Psion	Kempston	Price
Cambridge	y				£29.50 inc. joystick, £24 on its own.
Stonechip	y				£24.95
AGF	y				£33.95
AGF II		y			£16.95
Kempston				y	£15 without joystick, £24.50 with joystick
Protek		y			£14.95
Jiles III		y	y	y	£13.95
Pickard — from Success Services	y				£21.45

The No. 1* Football Game

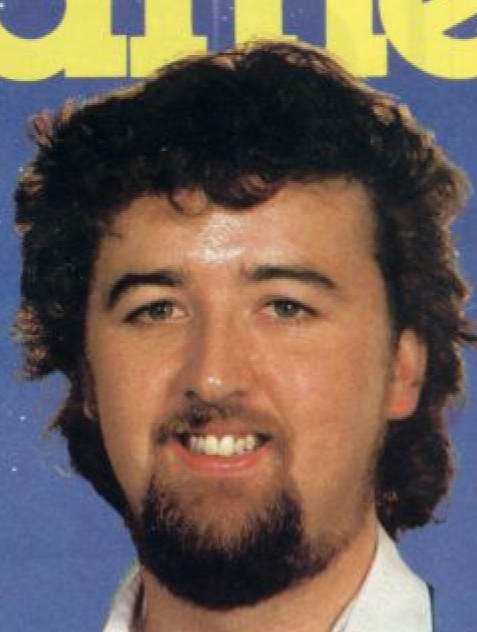
ZX81 16K, ZX Spectrum 48K†
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This outstanding game of skill and strategy is now widely available and you can join the many thousands of satisfied customers who have purchased the game. This is no five minute wonder – you will be playing this game for hours over many weeks (we know – our customers tell us!).



Kevin Toms

Some of the features of the game:–

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- ★ Transfer market
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Addictive

*ZX81 Chart, Home Computing Weekly 16.8.83

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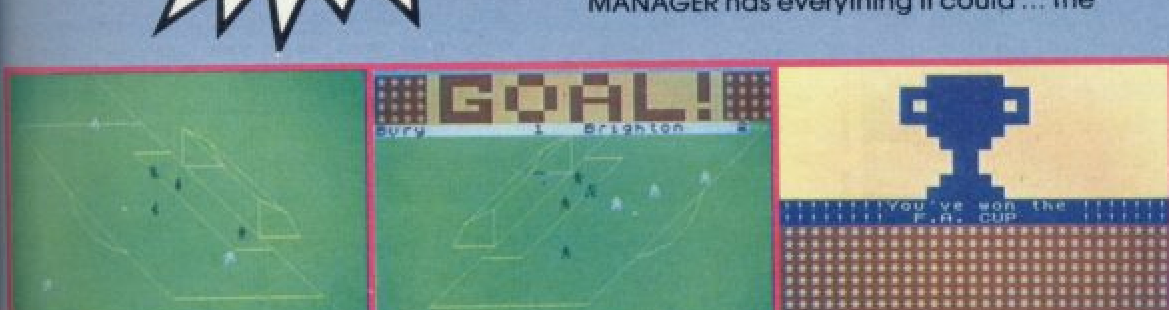
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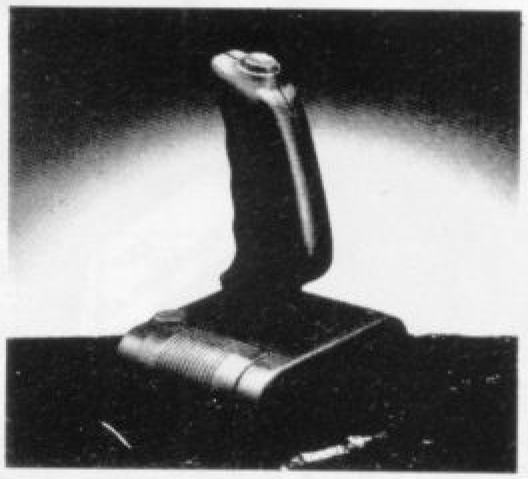
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Winning Battle

Marc Lucas to receive the Cambridge Award

THE WINNER of the £1,000 Cambridge Award, co-sponsored by *Sinclair User* and Cases Computer Simulations, is Mark Lucas of 52 Palmerston Road, London, SW14.

His winning entry, **Battle 1917,** a strategic war game for several players for the 48K Spectrum was, in the opinion of the judges, well-presented and the most playable of the Spectrum entries. Mike Johnston, a member of the judging panel, says: "It is an interesting game and has the advantage of simplicity. There are two opposing armies which both have tanks, cavalry and infantry."

Mark Lucas was surprised when he heard the result. He says: "I am thrilled to have been chosen as the winner. I did not really expect to win the competition." He will receive a cheque for £1,000, the Cambridge Trophy, and the royalties for sales of the game when CCS start production.

Lucas works with computers professionally as he is a commercial analyst at IBM.

He bought a Spectrum on Christmas Eve as a late Christmas present for his daughter. He says: "Fathers usually buy train sets for their sons so that they can play with them. I bought a Spectrum for my daughter for the same selfish reason."

Board games have always interested Lucas. When he was young he used to make different games using paper overlays on a peg chess board. Battle 1917 is an extension of this technique. He says: "The computer will now take all the monotony out of throwing the dice and making the moves.

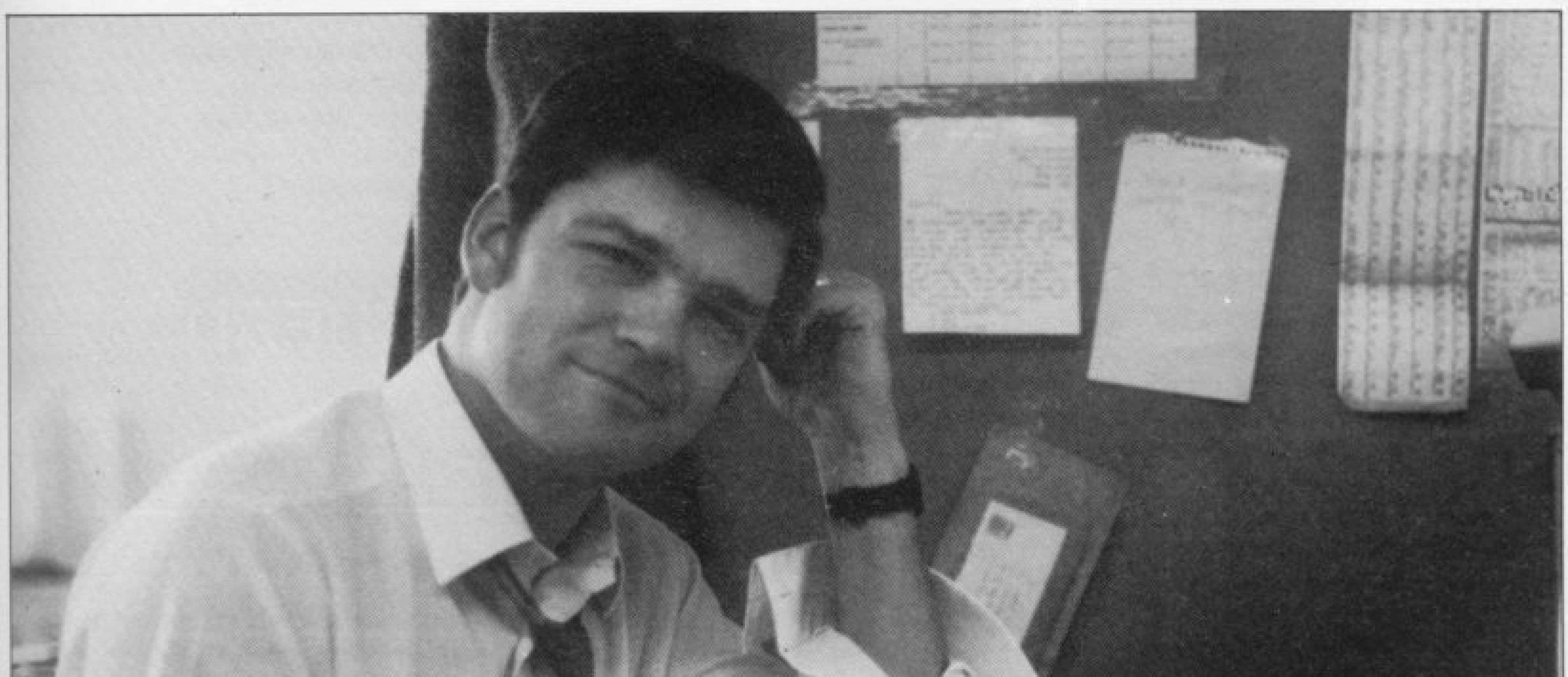
Lucas intends to spend some of his prize money on computer equipment. He is already working on another version of his winning game and is thinking of translating it to another machine, such as the BBC Microcomputer.

The second Spectrum prize goes to another war game, **War 70.** In the judges' opinion it was very close to the first prize winner. The third prize was won by **Oligopoly,** a game which resembles Kingdom and in which the players have to rely on leadership qualities as well as business acumen. Both prize winners will receive a cheque.

The winner of the ZX-81 section of the competition is John Sherry of Chapel House, Pepper Street, Keele, Staffs, with **Broodslayer,** a graphic adventure for the 16K machine.

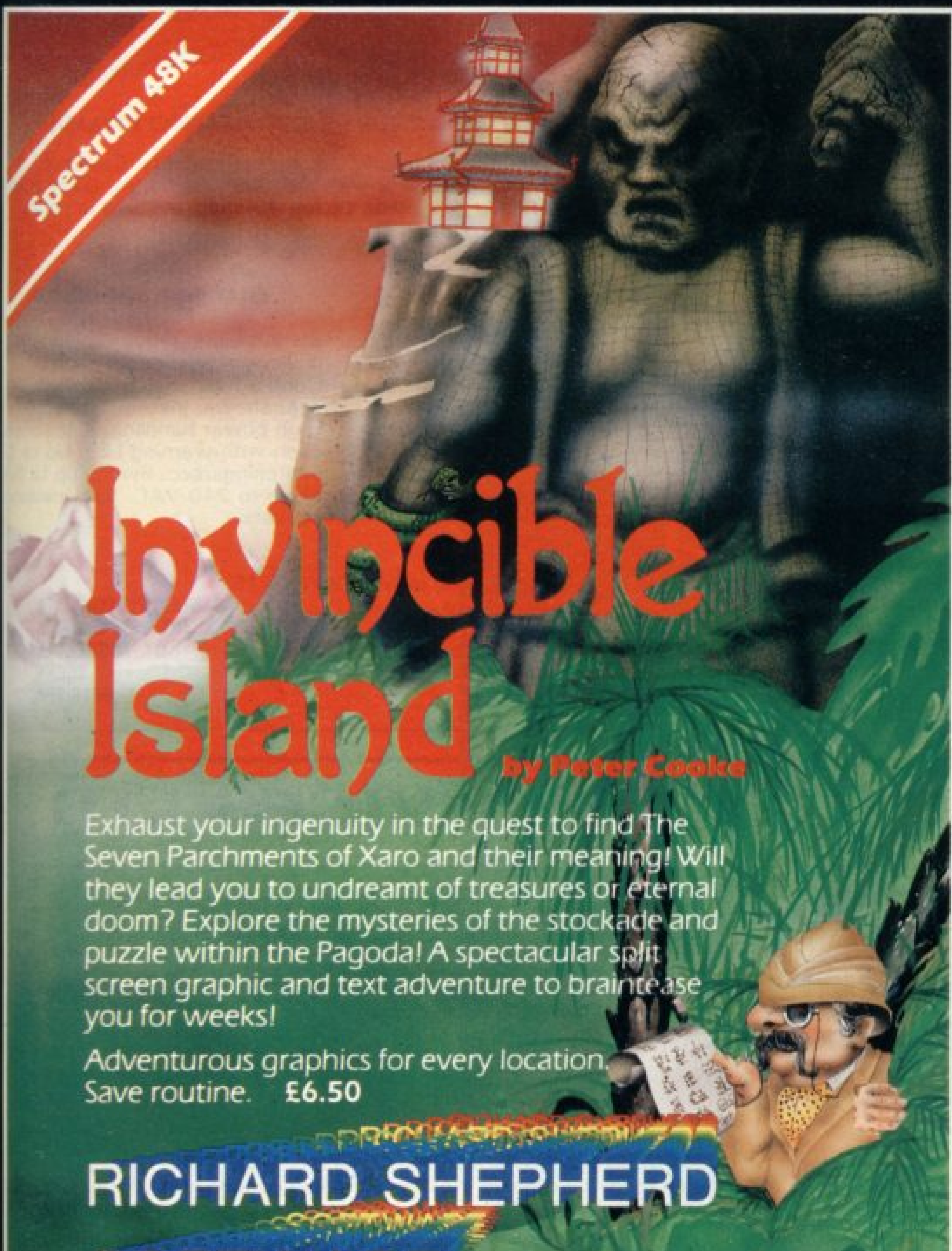
The second prize goes to **Borderland** and the third to Both games are adventures.

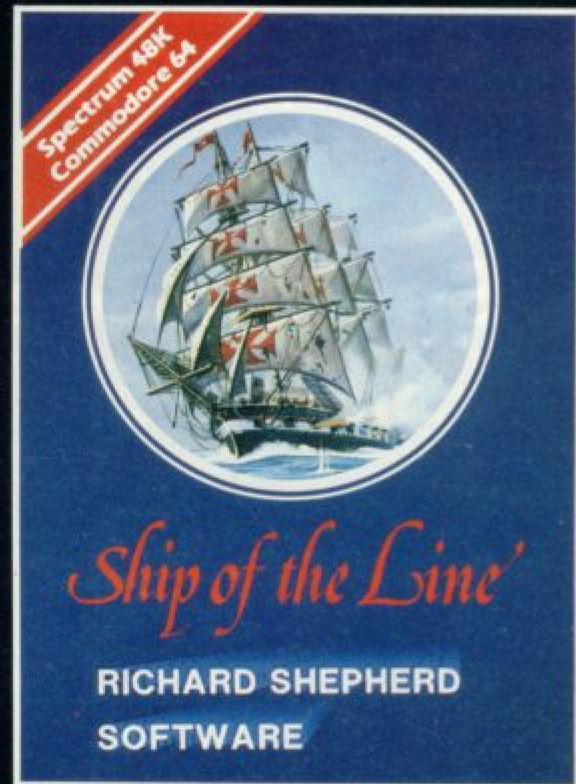
Presentation of cheques and the trophy for Programmer of the Year will be made at the next ZX Microfair, at Alexandra Palace, London, December 3 and 4.



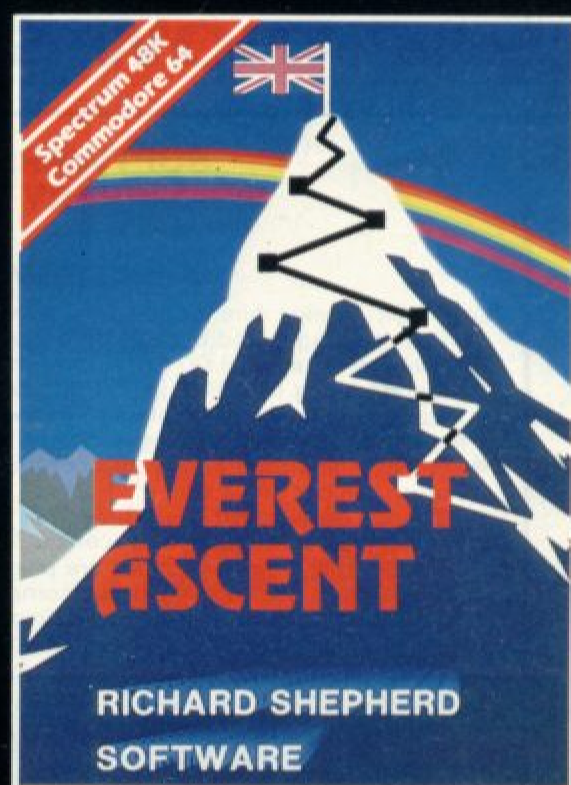
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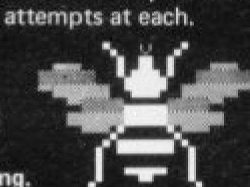
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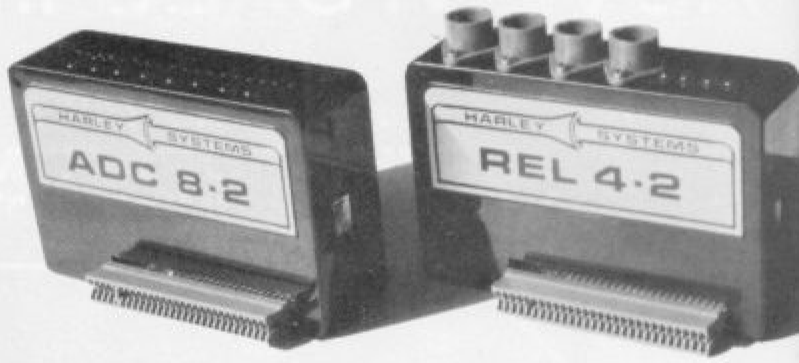
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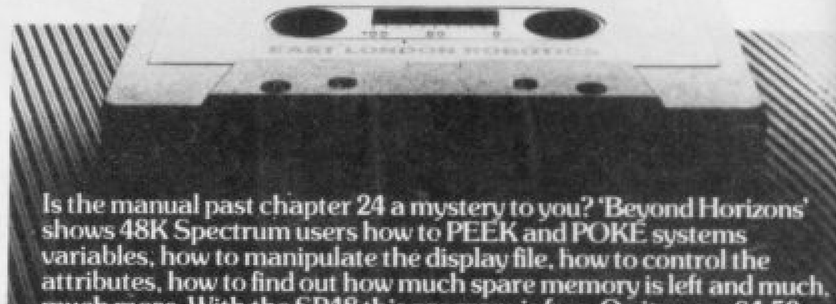
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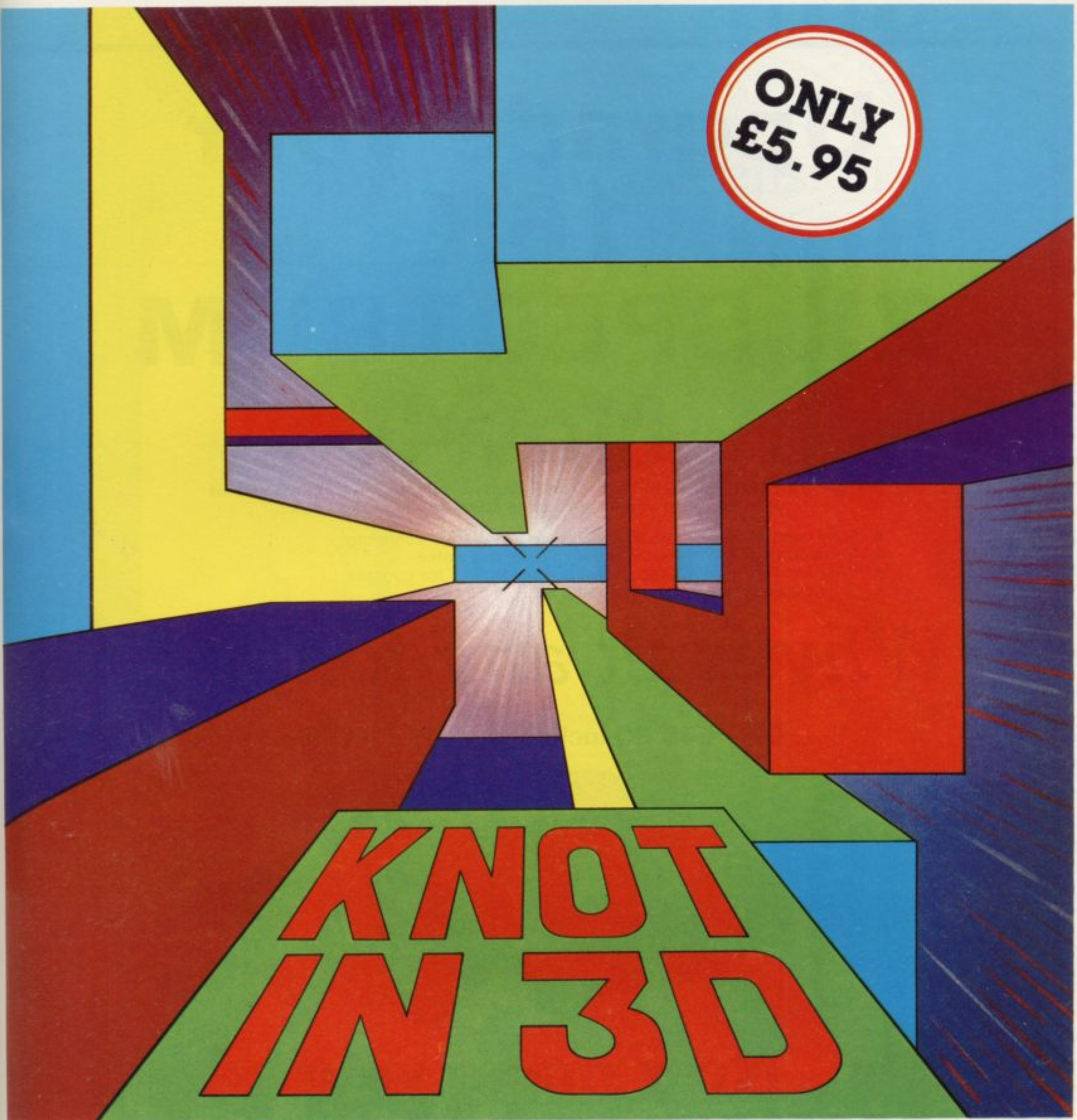
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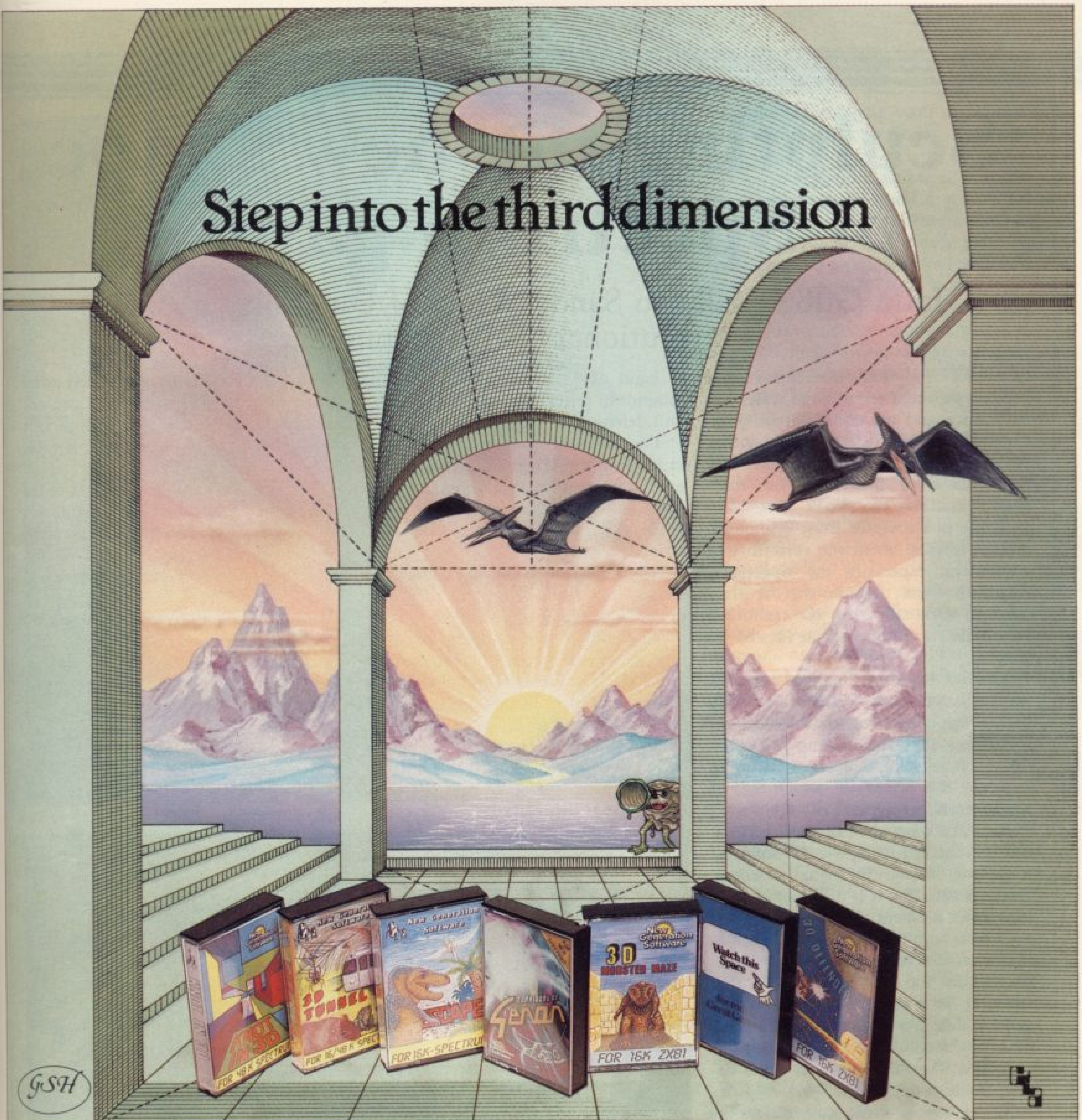
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Sculpting the new shape of Spectrum games

John Gilbert talks to Sandy White of Quicksilva about a revolutionary 3-D technique

SCULPTURE and computers may seem at different ends of the scale, just as science and art are different disciplines. Sandy White, 23-year-old author of **Ant Attack,** a new game for the 48K Spectrum from Quicksilva, has managed to combine the two.

White is a sculptor from Edinburgh and he learned about the versatility of computers, especially the Spectrum, earlier this year. Despite that he managed to create a new 3D technique which has revolutionised the idea of 3D gaming.

The technique was finalised using his brother's computer. White says: "My brother has a Spectrum and we thought about how slow the existing games for the machine were. I decided to try to improve the speed at which games would work and started early this year."

Ant Attack is a good example of what can be achieved using the 3D softsolid technique, which is being patented. White is sure that it is different enough to warrant a patent. He says:

"I have seen other 3D games, such as the Atari Zaxxon. The difference between this and my technique is that softsolid is totally machine-independent. It does not matter on which computer a soft-solid game is running but programs like Zaxxon are to some degree machine-dependent."

White sent a video cassette to the software company Quicksilva, which was immediately impressed and excited about the potential of the game. Mark Eyles, a spokesman for Quicksilva, says:

"We received the tape and thought 'So what's new?' We took it to a friend who had a video recorder and played it. We were amazed. The technique was obviously something new."

As a result of first impressions, Quicksilva hurriedly telephoned White in Scotland and arranged for him to fly to meet representatives of the company at Southampton. Within 24 hours of the arrangement being made White's new game was under contract.

The game involves exploration of a walled city, called Antescher, which is situated in the middle of a great desert. A band of ants have made the sand mounds in the city their home and they will defend it to the death.

The walls of the city are the best example of the 3D technique. The player characters seem to disappear behind them and, with clever use of light and shade, the walls appear in 3D representation.

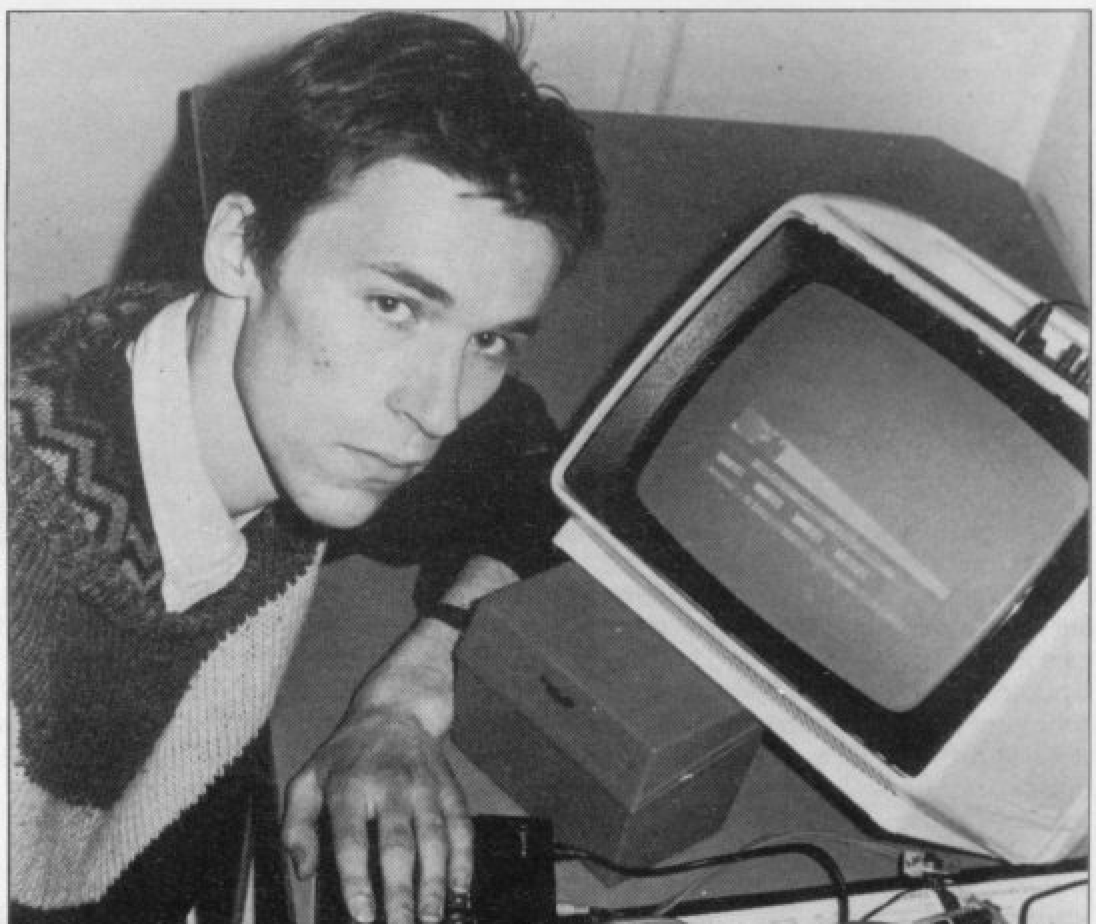
Not content with moving a character round the screen, White included code in the game which would allow the user to have almost instant access to up to four views of the current surroundings, all in 3D. The change from one view to another is almost instantaneous.

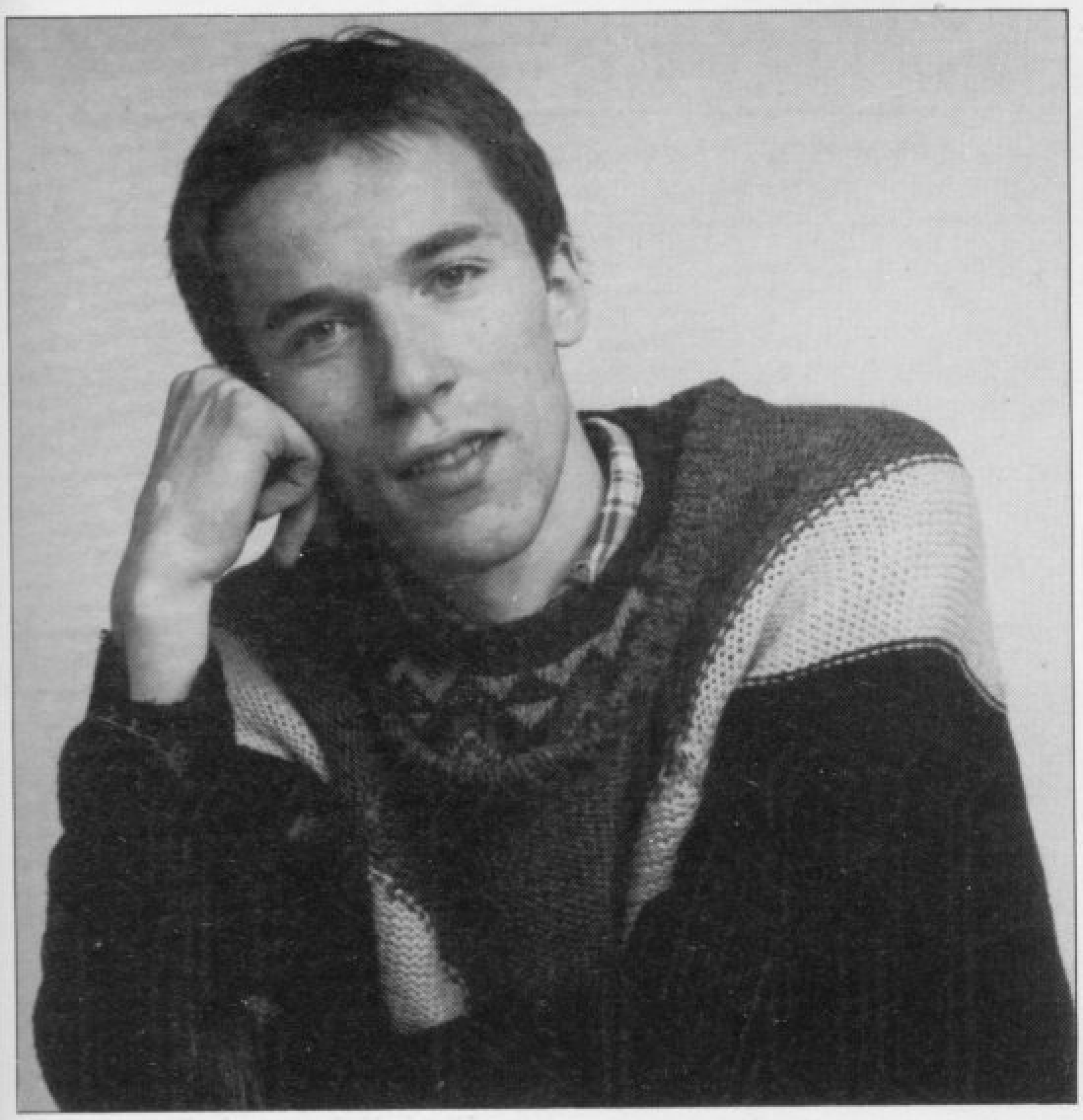
A great deal of attention has been paid to detail as the characters, which can either be boy or girl, move when they jump up and down over the walls of the city.

The girl's skirt moves up and down when the character jumps and you can imagine that if the girl had pigtails White would have made them movable as well.

White is sufficiently confident of his technique to apply for a patent. He says: "The 3D technique is universal so it can, of course, be applied to any machine. In fact, it was not developed on a Z-80-based machine. I did most of the work on a 6502 system." The 6502 brand of machines include the BBC microcomputer and the Oric One.

White says the patent "will be for the 3D display technique used and not for the games in which it is used." If the patent application is accepted it will mark a first in the Sinclair market, especially where software techniques are concerned.





White is a sculptor first and a computer user second. It is not long before some type of sculpture is put into his computer projects. "The 3D softsolid technique crosses many areas. The shapes which are created using it have more to do with the forms in sculpture than with mathematics. Obviously some maths are involved but I have never been brilliant in that department."

Despite its quick acceptance of Ant Attack, Quicksilva was not the first company to be approached. When White had completed the game he sent a video cassette of the graphics to Sinclair Research, which he thought would be interested in something new for its software library.

He heard nothing from Sinclair for several months and when he telephoned the company he received a strange answer from a company which is at the fountainhead of technology — Sinclair Research had not been able to look at the video because the company did not possess a video recorder. The video cassette was returned and it was then that White sent a copy to Quicksilva. Its quick response to the game surprised even the author.

White is now planning to create a series of games using the softsolid technique. Not surprisingly it will be Quicksilva which will market the results of his efforts.

"I will be staying with Quicksilva because it gave me my big chance. I will be producing more games because the 3D softsolid technique is geared more towards the games market than towards any technical market there may be," he says.

Apart from creating new forms of 3D games, White is still interested in perfecting new forms of sculpture. His

'The characters seem to disappear behind the walls of the city'

concepts have nothing to do with models made from clay, stone or even tyres. It is what he terms electronic sculpture which has been born from his interest in electronics, computing and sculpting. The only working parts of his creations are a black box, two microchips and a speaker. The chips produce the sound which forms the sculpture.

His lastest creation is about a robot walking along a beach, looking out to sea and thinking how lucky it is to be free and experiencing such sensations. The sound track includes a robotic voice which recites a type of poetry.

The imagination which is put into these objects is also active within his games. It has been suggested that as Virgin Games puts recording stars on the back of its tapes, Quicksilva should do the same with White's 'noises.'

Ant Attack is published at a time when Quicksilva is planning changes in direction. It has just become a limited company and has created a subsidiary, Software Studios. Mark Eyles says of the new company:

"Its creation is not really a move from Quicksilva. Software Studios has nothing to do with the running of Quicksilva or the products we have. It is a company which is being run by John Hollis, who wrote Time Gate and Aquaplane."

Hollis was linked earlier this year with the Quicksilva software laboratory, which exists at a secret location. The laboratory was to develop new software for Quicksilva and it seems that Software Studios is the result.

"Hollis will concentrate his programming skills in this company and products created by him and his team of programmers will be marketed under the name of Software Studios," says Eyles.

The new company's first release was **Games Designer,** a utility program for the 48K Spectrum with which people can design their own arcade-style games. Quicksilva thinks Games Designer, along with Ant Attack, will be one of its best-sellers during the pre-Christmas period. The package shows the Quicksilva command of the games market but, although Quicksilva will continue to concentrate on games, it will be releasing some educational software next year. Its only deviation from the games scene so far has been a stab at marketing a word processor, **Eddie,** which did not have much impact. Now Quicksilva sees the software market shifting in emphasis. Eyles says:

"Of course, games will continue to dominate the scene but next year there will be a change towards the educational and business end of the market. For that reason we have some educational software packages being developed and they should be released next year."

Next year there will be many changes at Quicksilva. It is already one of the biggest software manufacturers for the Sinclair market in Britain. With writers like White, its name as one of the leaders of the market should be consolidated.

The Hobbit. Now the best isa

"After a very short time I found that 'The Hobbit' was becoming almost a way of life rather than a game, and so when I finished it for the first time I was partly sad because I felt that all the fun and adventure had ended, but I was wrong. Even now I am discovering new things about the game and feel that it will be some time until all of its secrets are revealed to me."
MR. J. STERN, Herts

"I have at last received your 'Hobbit' program and would like to congratulate you on its excellence. After four days of sweat and tears I have completed only 37.5 per cent of the adventure. The program has lived up completely to expectations, and there is no doubt about it being the best production for the Spectrum to date. You have surpassed all others w... program."

"A lot of fun."
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"...cations in the Adventure are ...e excellent graphics. We ...mplete 7.5 ...

...ures. The ...hed plot ...erior to any ... for the"
...COMPUTER

"...isty Mountains ..., this game is ...eat to play and is No. 1 for ...nd excitement."
GORDON DEMPTSTER, Scotland

"...hanks again for an excellent game in 'The Hobbit'. I feel I have really got my money's worth out of playing time. Congratulations!"
MR. P. RUSHTON, Leeds

"The most powerful computer game yet invented."
COMPUTER WEEKLY

"Within my circle of friends this game has become something of an obsession. We meet every Friday night at someone's house and spend 3-4 hours on 'The Hobbit'. Friday night would not be the same without 'The Hobbit'."
CHRISTINE VERCHILD, Wilts

"One new Adventure game stands head and shoulders above the rest. It alone almost provides you with a good enough reason to buy a 48K Sinclair Spectrum. Not only does The Hobbit produce drawings of the main scenes, but it also understands proper sentences rather than pairs of words for its commands. It comes with a copy of J.R.R. Tolkien's classic book of the same name. It is the program with the most detailed and best written documentation ever."
WHAT MICRO

"This is an impressively packaged Adventure game which makes good use of the Spectrum's colour graphics. They have not only produced one of the best games for the Spectrum, but given everyone else a lesson in good game design."
PRACTICAL COM...

"I am the owner of a copy of 'The Hobbit' which is wonderful entertainment, and very challenging. I have other tapes and publications of yours, all of which are excellent."
MR. D.J. BURGH, Kent

"Having received the most excellent piece of programming I have ever seen, we have had no social life whatsoever. 'The Hobbit' has been dominating our lives since January and many nights have been spent until 3 o'clock trying to conquer it."
SIMON ROGERS, Avon

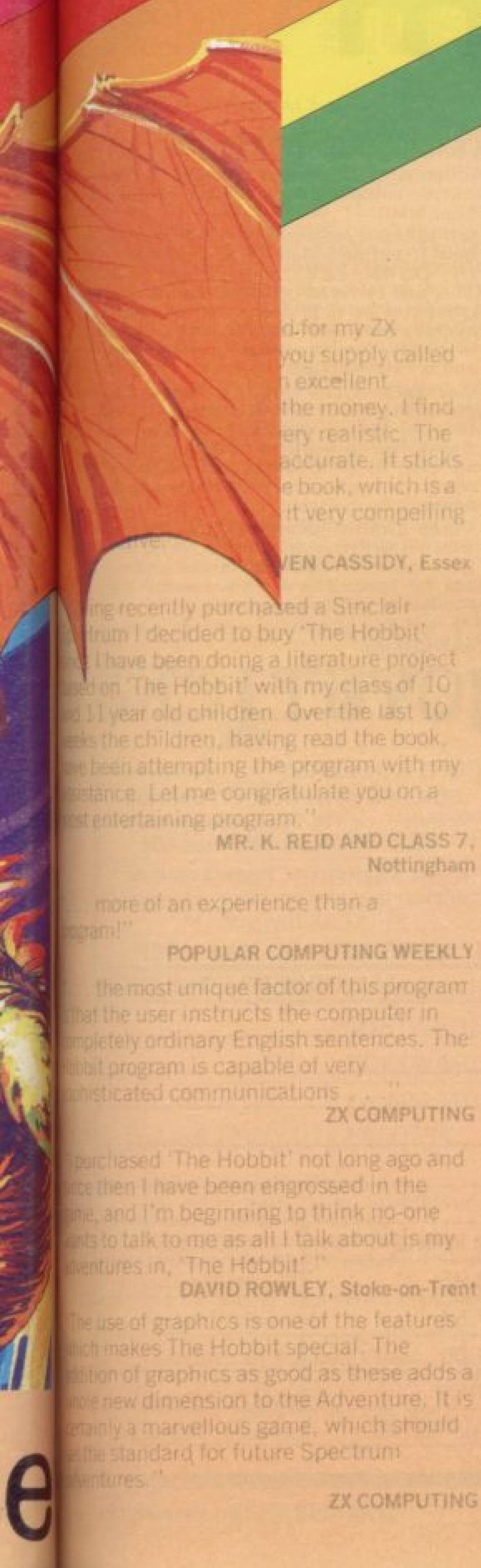
"I have recently purchased your excellent adventure game 'The Hobbit'. This ... greatly enhanced by the use of ... graphics, its availability in ... ...nation of having ..."



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"'The Hobbit' is a beautifully constructed, frantically-maddening, tortuous, gloriously inconsistent, thoroughly spooky adventure – far better than I could have hoped for and certainly the finest of the dozen or so adventure programs I have. In short, I congratulate the four who sweated for a year and a half to concoct such a super result."
MR. PETER JONES, South Glam

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"I am writing to congratulate you on your excellent program 'The Hobbit' for the Spectrum. I wake up in the middle of the night with an idea and have to load the adventure to try it out."
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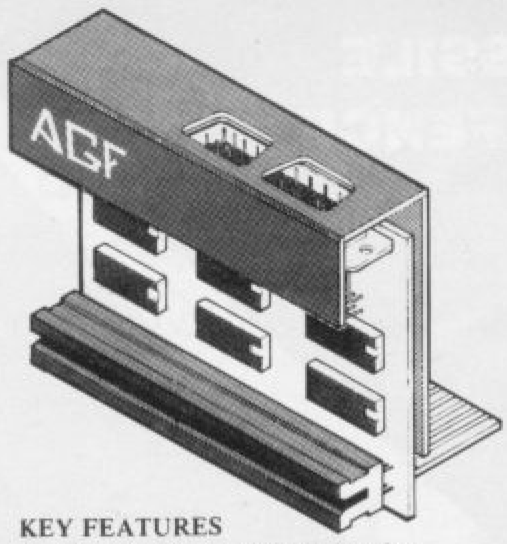
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PROGRAM PRINTOUT

Instructions for graphics characters are printed in lower-case letters in our listings. They are enclosed by brackets and separated by colons to distinguish them and the brackets and colons should not be entered.

Inverse characters are represented by the letter "i" and graphics characters by "g". Thus an inverse W would be represented by "iw", a graphics W by "gw", and an inverse graphics W by "igw".

Spaces are represented by "sp" and inverse spaces by "isp". Whenever any character is to be used more than once, the number of times it is to be used is shown before it, together with a multiplication sign. This "6*isp" means six inverse spaces and "(g4:4*i4:g3) would be entered as a graphic four, followed by an inverse four repeated four times, followed by a graphics three.

Where whole words are to be written in inverse letters they appear in the listings as lower-case letters. Letters to be entered in graphics mode on the Spectrum are underlined.

Inverse characters may be entered on the ZX-81 by changing to graphics mode and then typing the appropriate characters and on the Spectrum by changing to inverse video and typing the appropriate letters. Graphics characters may be entered on the ZX-81 by changing to graphics mode and then pressing symbol shift while the appropriate characters are entered. On the Spectrum graphics characters may be obtained by changing to graphics mode and then pressing the appropriate character. User-defined graphics will appear as normal letters until the program has been RUN.

GECKO

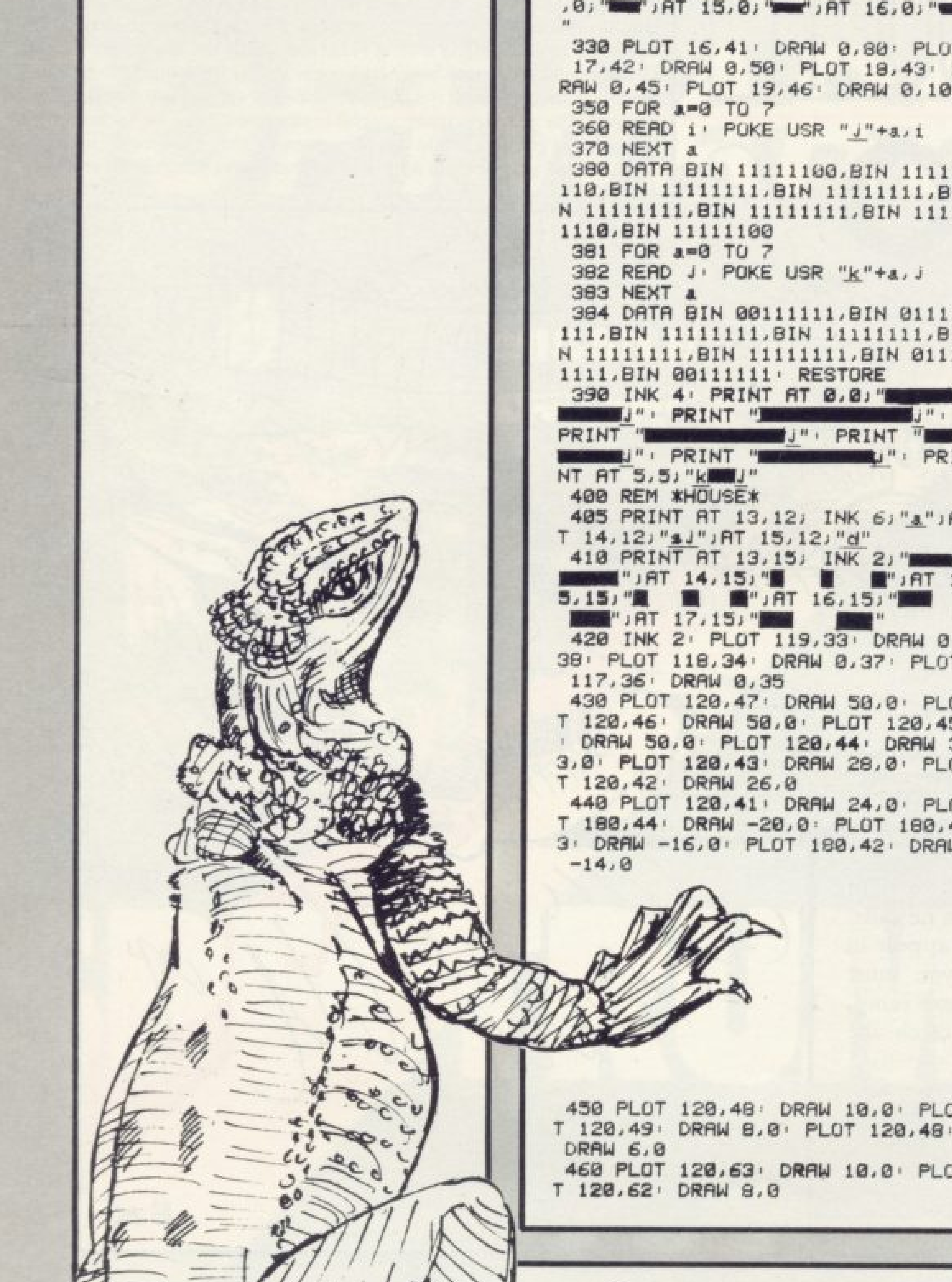


THE GECKO moves from left to right and you must catch him when he calls. When you catch him he will appear in your house. On the second sheet you must stand under the **Gecko** in the tree and jump, and on the third sheet you must catch the Gecko's friend.

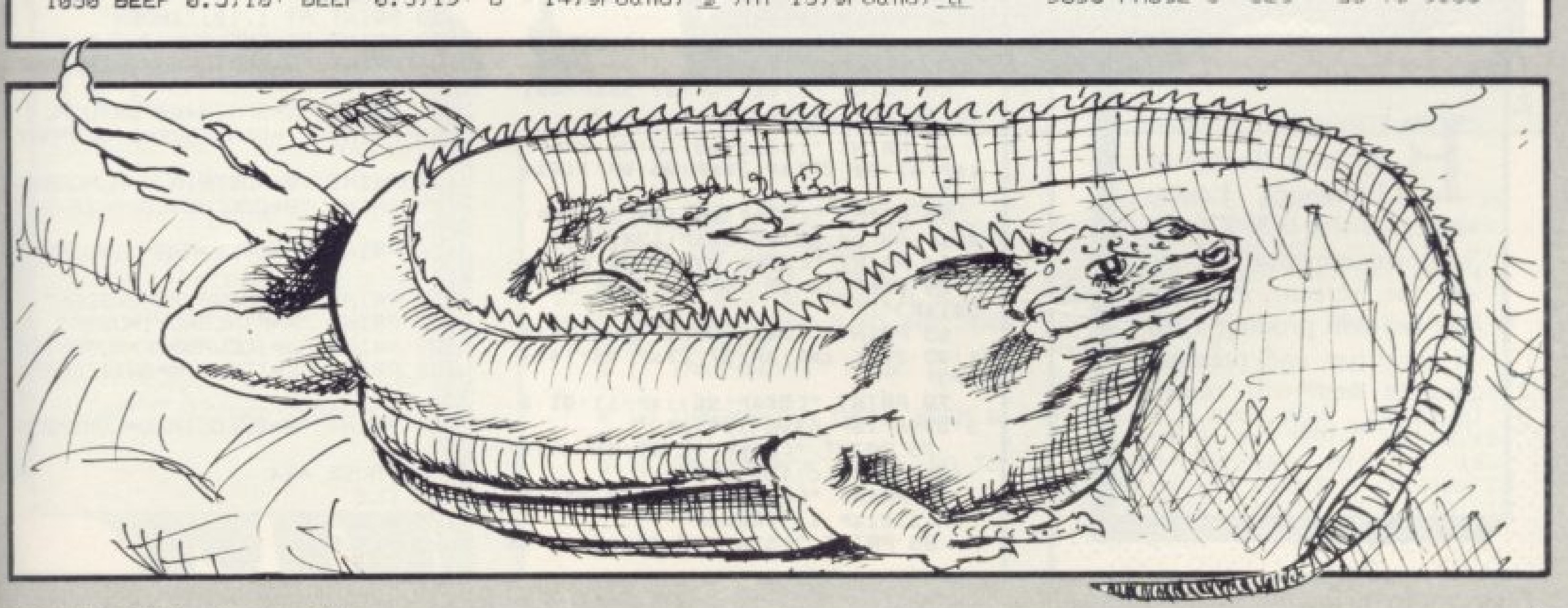
Graham Bower, aged 13, of Cranleigh, Surrey, who wrote the program for the 48K Spectrum, explains that a gecko is a type of African lizard.

```
  1 LET high=000: LET gec=9
  2 LET score=0
  3 GO SUB 9000
  4 LET life=5: LET gec=9
  5 LET ground=3
  6 LET gecko=0
  7 LET sheet=1
  8 LET sad=111
  9 REM *USRS*
 10 FOR a=0 TO 7
 20 READ b: POKE USR "a"+a,b
 30 NEXT a
 40 DATA BIN 00111100,BIN 01011
010,BIN 10000001,BIN 11011011,BI
N 10100101,BIN 10100101,BIN 1001
1001,BIN 01111110
 50 FOR a=0 TO 7
 60 READ c: POKE USR "s"+a,c
 70 NEXT a
 80 DATA BIN 00011000,BIN 01111
110,BIN 11111111,BIN 11111111,BI
N 01111111,BIN 10001101,BIN 1111
1101,BIN 11111101
 90 FOR a=0 TO 7
 100 READ d: POKE USR "d"+a,d
 110 NEXT a
 120 DATA BIN 01111100,BIN 10101
010,BIN 10101010,BIN 10101010,BI
N 10101010,BIN 00100100,BIN 0010
0100,BIN 11100111
 140 FOR a=0 TO 7
 150 READ e: POKE USR "f"+a,e
 160 NEXT a
 170 DATA BIN 00000000,BIN 00000
000,BIN 00001000,BIN 10010100,BI
N 01111111,BIN 00111110,BIN 1110
0111,BIN 00011001
 180 FOR a=0 TO 7
 190 READ f: POKE USR "g"+a,f
 200 NEXT a
 210 DATA 0,0,0,BIN 11111000,BIN
 11111110,BIN 10101011,BIN 11111
111,BIN 10001100
 220 FOR a=0 TO 7
 230 READ g: POKE USR "h"+a,g
 240 NEXT a
 250 DATA 0,0,0,BIN 01000000,BIN
 00100000,BIN 00100000,BIN 10000
000,0
 260 FOR a=0 TO 7
 270 READ p: POKE USR "l"+a,p
 280 NEXT a
 290 DATA 0,0,BIN 00001000,BIN 0
0010100,BIN 01111111,BIN 1111101
```

```
0,BIN 11100111,BIN 00011001
 300 REM *SET UP SCREEN*
 310 BORDER 0: PAPER 0: INK 2
 311 PAPER 4: PRINT AT 16,0;"
                                "
 312 PAPER 0
 320 PRINT AT 5,0;"███";AT 6,0;"█
█";AT 7,0;"███";AT 8,0;"███";AT 9,
0;"███";AT 10,0;"███";AT 11,0;"███"
;AT 12,0;"███";AT 13,0;"███";AT 14
,0;"███";AT 15,0;"███";AT 16,0;"███
"
 330 PLOT 16,41: DRAW 0,80: PLOT
 17,42: DRAW 0,50: PLOT 18,43: D
RAW 0,45: PLOT 19,46: DRAW 0,10
 350 FOR a=0 TO 7
 360 READ i: POKE USR "j"+a,i
 370 NEXT a
 380 DATA BIN 11111100,BIN 11111
110,BIN 11111111,BIN 11111111,BI
N 11111111,BIN 11111111,BIN 1111
1110,BIN 11111100
 381 FOR a=0 TO 7
 382 READ j: POKE USR "k"+a,j
 383 NEXT a
 384 DATA BIN 00111111,BIN 01111
111,BIN 11111111,BIN 11111111,BI
N 11111111,BIN 11111111,BIN 0111
1111,BIN 00111111: RESTORE
 390 INK 4: PRINT AT 0,0;"██████
██████j": PRINT "████████████████j":
PRINT "████████████████j": PRINT "███
███████j": PRINT "██████████████j": PRI
NT AT 5,5;"k███j"
 400 REM *HOUSE*
 405 PRINT AT 13,12; INK 6;"a";A
T 14,12;"sj";AT 15,12;"d"
 410 PRINT AT 13,15; INK 2;"████
██████";AT 14,15;"█   █   █";AT 1
5,15;"█   █   █";AT 16,15;"████
████";AT 17,15;"███     ███"
 420 INK 2: PLOT 119,33: DRAW 0,
38: PLOT 118,34: DRAW 0,37: PLOT
 117,36: DRAW 0,35
 430 PLOT 120,47: DRAW 50,0: PLO
T 120,46: DRAW 50,0: PLOT 120,45
: DRAW 50,0: PLOT 120,44: DRAW 3
3,0: PLOT 120,43: DRAW 28,0: PLO
T 120,42: DRAW 26,0
 440 PLOT 120,41: DRAW 24,0: PLO
T 180,44: DRAW -20,0: PLOT 180,4
3: DRAW -16,0: PLOT 180,42: DRAW
 -14,0
 450 PLOT 120,48: DRAW 10,0: PLO
T 120,49: DRAW 8,0: PLOT 120,48:
 DRAW 6,0
 460 PLOT 120,63: DRAW 10,0: PLO
T 120,62: DRAW 8,0
 470 PLOT 151,63: DRAW -3,0 : PL
OT 151,62: DRAW -1,0
 480 PLOT 151,48: DRAW -3,0: PLO
T 151,49: DRAW -1,0:
 490 PLOT 159,63: DRAW 3,0: PLOT
 159,62: DRAW 1,0
 500 PLOT 159,48: DRAW 3,0: PLOT
 159,49: DRAW 1,0
 510 PLOT 184,48: DRAW -3,0: PLO
T 184,49: DRAW -1,0
 520 PLOT 184,63: DRAW -3,0: PLO
T 184,62: DRAW -1,0
 530 PLOT 192,33: DRAW 0,38: PLO
T 193,34: DRAW 0,37: PLOT 194,35
: DRAW 0,36
 535 BEEP 0.3,10: PRINT AT 13,12
;" ";AT 14,12;"  ";AT 15,12;" "
 540 REM *MUD HUT ROOF*
 545 PRINT AT 9,20; INK 6;"a";AT
 10,20;"sj";AT 11,20;"d"
 550 INK 6: PLOT 153,100: DRAW -
40,-25: PLOT 153,100: DRAW -36,-
25
 560 FOR x=115 TO 195 STEP +4: C
IRCLE x,74,2: NEXT x
 595 BEEP 0.3,22: PRINT AT 9,20;
" ";AT 10,20;"  ";AT 11,20;" "
 600 REM *BEAMS TO MUD HUT*
 610 PRINT AT 9,14;"a";AT 10,14;
"sj";AT 11,14;"d"
 620 PLOT 153,100: DRAW -32,-25:
 PLOT 153,100: DRAW -29,-25: PLO
T 153,100: DRAW -25,-25: PLOT 15
3,100: DRAW -21,-25
 630 PLOT 153,100: DRAW -17,-25:
 PLOT 153,100: DRAW -13,-25: PLO
T 153,100: DRAW -9,-25: PLOT 153
,100: DRAW -5,-25: PLOT 153,100:
 DRAW -1,-25
 640 PLOT 153,100: DRAW 3,-25: P
LOT 153,100: DRAW 7,-25: PLOT 15
3,100: DRAW 11,-25: PLOT 153,100
: DRAW 15,-25: PLOT 153,100: DRA
W 19,-25: PLOT 153,100: DRAW 23,
-25: PLOT 153,100: DRAW 27,-25:
PLOT 153,100: DRAW 31,-25
 645 PLOT 153,100: DRAW 35,-25:
PLOT 153,100: DRAW 39,-25: PLOT
153,100: DRAW 43,-25
 650 BEEP 0.3,0: PRINT AT 9,14;"
 ";AT 10,14;"  ";AT 11,14;" "
 660 REM *SET UP SCORE BOARD*
 670 INK 5: PRINT AT 0,20;"kSCOR
E=██j"; INK 1;AT 1,20;"kLIVES=█
█j"; INK 5;AT 2,20;"kSHEET=██j
"; INK 1;AT 3,20;"kHIGH =██ j";
INVERSE 1;AT 3,27;high; INVERSE
0; INK 7
 680 PRINT AT 2,27; INVERSE 1; I
NK 5;sheet; INVERSE 0; INK 7
 700 REM *THEME MUSIC*
 705 GO SUB 1000
 795 REM *WORKS*
 796 LET rnd=INT (RND*20)
 797 IF sheet=2 AND rnd=5 THEN
PRINT AT 15,9ec;"fgh": BEEP 0.05
,-30: BEEP 0.01,-40: BEEP 0.05,2
0: BEEP 0.05,30: GO TO 6000
 798 IF sheet=3 AND rnd=5 THEN
```



```
PRINT AT 15,gec;"fgh": BEEP 0.05
,-30: BEEP 0.01,-40: BEEP 0.05,2
0: BEEP 0.05,30: GO TO 7000
 799 IF rnd=5 THEN  PRINT AT 15,
gec; INK 4;"fgh": BEEP 0.05,-30:
 BEEP 0.1,-40: BEEP 0.05,20: BEE
P 0.05,30: GO SUB 5000
 800 IF ground<3 THEN  LET groun
d=3
 801 IF ground>13 THEN  LET grou
nd=13
 802 PRINT AT 13,ground; INK 7;"
a";AT 14,ground;"s";AT 15,ground
;"d": IF gecko=10 THEN  LET shee
t=3: PRINT AT 2,27; INVERSE 1; I
NK 5;sheet; INK 7; INVERSE 0
 803 IF gecko=3 AND sad<>222 THE
N  LET sheet=sheet+1: PRINT AT 2
,27; INVERSE 1; INK 5;sheet; INK
 7; INVERSE 0: LET sad=222
 804 IF gec<4 THEN  PRINT AT 15,
gec;"   ": LET gec=11
 805 PRINT AT 15,gec;"   ": LET
gec=gec-1: BEEP 0.09,30: PRINT A
T 15,gec;"lgh"
 806 IF ground=gec THEN  BEEP 0.
05,50: PRINT AT 13,ground;" ";AT
 14,ground;"a";AT 15,ground;"d":
 BEEP 0.05,50: PRINT AT 14,groun
d;" ";AT 15,ground; INK 2;"a"; I
NK 7: BEEP 0.05,30: LET life=lif
e-1
 807 PRINT AT 1,28; INVERSE 1; I
NK 1;life: INK 7: INVERSE 0
 808 IF life<1 THEN  GO SUB 1000
: GO SUB 1050: GO TO 3
 809 IF INKEY$="" THEN  GO TO 79
6
 810 IF INKEY$="p" THEN  BEEP 0.
05,-30: BEEP 0.05,-40: PRINT AT
13,ground;" ";AT 14,ground;" ";A
T 15,ground;" ": LET ground=grou
nd+1: GO TO 796
 820 IF INKEY$="o" THEN  BEEP 0.
05,-30: BEEP 0.05,-40: PRINT AT
13,ground;" ";AT 14,ground;" ";A
T 15,ground;" ": LET ground=grou
nd-1: GO TO 796
 830 IF INKEY$="q" THEN  LET sco
re=score+5: PRINT AT 0,27; INK 5
; INVERSE 1;score; INVERSE 0; IN
K 7: FOR r=30 TO 40: BEEP 0.009,
r: NEXT r: PRINT AT 15,ground;"
";AT 14,ground;"d";AT 13,ground;
"s";AT 12,ground;"a";AT 14,groun
d;" ";AT 13,ground;" ";AT 12,gro
und;" ": LET ground=10: GO TO 79
6
 890 GO TO 796
1005 PAUSE 50
1010 BEEP 0.25,19: BEEP 0.25,18:
 BEEP 0.25,19: BEEP 0.25,21: BEE
P 0.25,23: BEEP 0.25,25
1020 BEEP 0.25,26: BEEP 0.25,28:
 BEEP 0.25,26: BEEP 0.25,25: BEE
P 0.25,23: BEEP 0.25,21: BEEP 0.
25,19: PAUSE 50
1030 RETURN
1050 BEEP 0.5,18: BEEP 0.5,19: B
EEP 0.25,21: BEEP 0.25,23: BEEP
0.25,21: BEEP 0.25,18: BEEP 0.25
,14: BEEP 0.125,26
1060 RETURN
5000 LET sas=0
5001 IF ground<3 THEN  LET groun
d=3
5002 IF ground>10 THEN  LET grou
nd=10
5006 LET sas=sas+1: PRINT AT 13,
ground;"a";AT 14,ground;"s";AT 1
5,ground;"d": BEEP 0.05,30: BEEP
 0.05,40
5007 IF sas=5 THEN  RETURN
5008 IF INKEY$="" THEN  GO TO 50
01
5009 IF ground=gec THEN  LET sco
re=score+13: BEEP 0.3,50: PRINT
AT 17,18;"lgh": PRINT AT 0,27; I
NK 5; INVERSE 1;score; INVERSE 0
: LET gecko=gecko+1: PRINT AT 14
,17;gecko: RETURN
5010 IF INKEY$="p" THEN  PRINT A
T 15,ground;" ";AT 14,ground;" "
;AT 13,ground;" ": LET ground=gr
ound+1: GO TO 5001
5020 IF INKEY$="o" THEN  PRINT A
T 15,ground;" ";AT 14,ground;" "
;AT 13,ground;" ": LET ground=gr
ound-1: GO TO 5001
5030 GO TO 5001
6000 LET sas=0
6009 LET sas=sas+1: IF sas>20 TH
EN  PRINT AT 5,3;"  ": GO TO 800
6010 IF ground<3 THEN  LET groun
d=3
6020 IF ground>10 THEN  LET grou
nd=10
6025 PRINT AT 5,3;"fg"
6030 PRINT AT 13,ground;"a";AT 1
4,ground;"s";AT 15,ground;"d";AT
 15,gec;"fgh": BEEP 0.05,30: BEE
P 0.05,40
6035 PRINT AT 13,ground;" ";AT 1
4,ground;" ";AT 15,ground;" "
6040 IF INKEY$="" THEN  GO TO 60
09
6050 IF INKEY$="q" AND ground=3
THEN  LET gecko=gecko+1: PRINT A
T 14,17; INK 7;gecko: LET score=
score+1: PRINT AT 5,3;"  ": FOR
r=30 TO 50: BEEP 0.05,r: NEXT r:
 GO TO 800
6060 IF INKEY$="o" THEN  LET gro
und=ground-1: GO TO 6009
6070 IF INKEY$="p" THEN  LET gro
und=ground+1: GO TO 6009
6080 GO TO 6009
7000 LET sas=0
7010 IF ground<3 THEN  LET groun
d=3
7020 IF ground>10 THEN  LET grou
nd=10
7025 PRINT AT 13,ground;"a";AT 1
4,ground;"s";AT 15,ground;"d"
7030 PRINT AT 15,9;"fgh": BEEP 0
.025,0: BEEP 0.025,30: BEEP 0.05
,-40: PRINT AT 13,ground;"a";AT
14,ground;"s";AT 15,ground;"d"
7035 PRINT AT 13,ground;" ";AT 1
4,ground;" ";AT 15,ground;" "
7040 PRINT AT 15,gec;"fgh": PRIN
T AT 13,ground;"a";AT 14,ground;
"s";AT 15,ground;"d"
7045 PRINT AT 13,ground;" ";AT 1
4,ground;" ";AT 15,ground;" "
7050 LET sas=sas+1: IF sas=20 TH
EN  GO TO 800
7055 IF ground=9 THEN  PRINT AT
13,ground;" ";AT 14,ground;" ";A
T 15,ground;"    ": BEEP 0.05,50:
 BEEP 0.05,40: BEEP 0.05,30: BEE
P 0.05,20: BEEP 0.05,10: LET gec
ko=gecko+1: PRINT AT 14,17;gecko
: GO TO 800
7060 IF INKEY$="" THEN  GO TO 70
10
7070 IF INKEY$="p" THEN  LET gro
und=ground+1: GO TO 7010
7080 IF INKEY$="o" THEN  LET gro
und=ground-1: GO TO 7010
7090 GO TO 7010
9000 IF score>high THEN  LET hig
h=score: BORDER 0: PAPER 0: CLS
: INK 7: PRINT "GECKO
 High=";high
9005 BORDER 0: PAPER 0: CLS : IN
K 7: PRINT "GECKO              Hig
h=";high
9010 PRINT : PRINT : PRINT "
 1 Keyboard                 ": PR
INT : PRINT "     2 High score r
e-set": PRINT : PRINT "      3 st
art game"
9015 PRINT : PRINT "      4 Instr
uctions"
9020 IF INKEY$="" THEN  GO TO 90
20
9030 IF INKEY$="2" THEN  LET hig
h=000: PRINT AT 0,0;"GECKO
      High=";high;"    "
9040 IF INKEY$="3" THEN  CLS : R
ETURN
9045 IF INKEY$="4" THEN  GO TO 9
060
9050 GO TO 9020
9060 CLS : BORDER 7: PRINT AT 1,
0; INK 7;"[redacted]"
9070 PRINT AT 0,13;"GECKO"
9080 PRINT AT 2,0;"o moves left,
p moves right,q   jumps over th
e gecko.The Gecko  moves from le
ft to right.You    must catch th
e Gecko when he    calls(fgh).Wh
en you catch the   Gecko you see
 him in your house.The number of
 Geckos you catch  is shown in t
he window of your  house.On the
second sheet you   must stand un
der the Gecko in   the tree and
jump.When a Gecko  calls you hav
e 2 secs. to catch  it.On the th
ird sheet you must catch the Gec
kos friend."
9081 PRINT : PRINT " a": PRINT "
 s": PRINT " d lgh"
9090 PAUSE 0: CLS : GO TO 9000
```



Europe



EUROPE, written by John Holden of Blackpool, Lancashire, for the 16K ZX-81, will print a map of Europe on the screen. Pressing any key will produce a list of countries and pressing another key will return you to the map.

```
   1 REM "EURUPE"
   5 PRINT "(5*sP:9r:96:22*sP:3*
isP)"
  10 PRINT "(4*sP:93:isP:1J:isP:
10*sP:96:isP:9w:94:4*sP:93:5*isP
)"
  15 PRINT "(5*sP:97:isP:91:9*sP
:6*isP:96:sP:9w:98:5*isP)"
  20 PRINT "(16*sP:99:7*isP:95:7
*isP)"
  25 PRINT "(15*sP:93:2*isP:9e:9
r:2*isP:95:sP:98:7*isP)"
  30 PRINT "(14*sP:93:3*isP:95:9
q:2*isP:9w:96:8*isP)"
  35 PRINT "(12*sP:93:9q 3*isP i
9:9e:99:ih:12*isP)"
  40 PRINT "(13*sP:isP:if:3*isP:
sP:14*isP)"
  45 PRINT "(7*sP:99:91:3*sP:4*i
sP:9w:sP:14*isP)"
  50 PRINT "(6*sP:98:13:91:3*sP:
isP:97:9e:2*isP:2*sP:96:99:11*is
P)"
  55 PRINT "(4*sP:96:isP:93:isP:
4*sP:93:94:2*isP:3*sP:13*isP)"
  60 PRINT "(3*sP:93:i4:9e:sP:is
P:94:3*sP:ie:95:isP:9e:2*sP:9w:1
3*isP)"
  65 PRINT "(3*sP:92:97:9w:i2:is
P:95:3*sP:isP:sP:97:2*sP:98:14*i
sP)"
  70 PRINT "(5*sP:96:isP:i1:91:9
3:2*96:isP:4*96:15*isP)"
  75 PRINT "(6*sP:92:97:96:6*isP
:id:2*isP:ic:13*isP)"
  80 PRINT "(4*sP:92:9w:99:2*isP
:in:11*isP:ii:10*isP)"
P  85 PRINT "(5*sP:98:4*isP:io:is
P:i8:19*isP)"
  90 PRINT "(5*sP:98:2*isP:17:6*
isP:i9:16*isP)"
  95 PRINT "(sP:isP:96:2*sP:98:5
*isP:im:2*isP:19:2*isP:ia:8*isP:
9e:91:4*isP)"
  96 PRINT "(93:3*isP:96:99:16*i
sP:9e:97:isP:sP:98:5*isP)"
  97 PRINT "(22*isP:2*sP:isP:2*s
P:5*isP)"
  98 PRINT "(i6:2*isP:i5:2*isP:9
e:4*sP:il:9w:92:6*isP:95:7*sP:97
:3*isP)"
 105 IF INKEY$="" THEN GOTO 105
 110 CLS
 119 PRINT AT 1,10;"INDEX"
 120 PRINT "1=ENGLAND/2WALES"
 121 PRINT "3=SCOTLAND/4=IRELAND
"
 122 PRINT "5=SPAIN/6=PORTUGAL"
 123 PRINT "7=FRANCE/8=W-GERMANY
"
 124 PRINT "9=AUSTRIA/A=HUNGARY"
 125 PRINT "B=CZECHOSLOVAKIA/C=P
OLAND"
 126 PRINT "D=E-GERMANY/E=DENMAR
K"
 127 PRINT "F=NORWAY/G=SWEDEN"
 128 PRINT "H=FINLAND/I=USSR"
 129 PRINT "J=ICELAND/K=RUMANIA"
 130 PRINT "L=ITALY/M=SWITZELAND
"
 131 PRINT "N=BELGUIM/O=LUXEMBUR
G"
 132 PAUSE 4E4
 133 CLS
 134 GOSUB 5
 135 RETURN
```

FORESTER



MOVE your man around the forest to find his lunch, avoiding the trees, swamps and pits. Once you have scored three points you move on to the next screen. Move quickly, because obstacles will materialise in your way.

Forester was written for the 16K Spectrum by Simon Hillns of Upper Norwood, London.

```
   1 LET H=0: BORDER 1: PAPER 1:
 CLS : PRINT AT 10,4; INK 6;"DO
YOU NEED INSTRUCTIONS?"
   2 IF INKEY$="y" THEN  BEEP 0.
2,10: BEEP 0.2,20: BEEP 0.2,10:
BEEP 0.05,35: BEEP 0.05,40: BEEP
 0.5,5: GO TO 7
   3 IF INKEY$<>"y" THEN  GO TO
4
   4 IF INKEY$="n" THEN  BEEP 0.
5,10: GO TO 12
   5 IF INKEY$<>"n" THEN  GO TO
2
   7 GO SUB 8000
   8 BORDER 1: PAPER 1: CLS : PR
INT AT 0,6; INK 6;"PLEASE PRESS
ANY KEY": PRINT AT 4,11; INK 4;"
FORESTER@": PLOT 88,136: INK 4:
DRAW 72,0
   9 PRINT AT 6,7; INK 5;"MOVE U
SING 5 6 7 8"
  10 PRINT AT 2,3; INK 5;"
                  ": PRINT AT 8,10;
INK 6;"e = YOUR MAN": PRINT AT 1
0,10; INK 0;"b": PRINT AT 10,12;
 INK 6;"= HAMPER": PRINT AT 12,1
0; INK 4;"a": PRINT AT 12,12; IN
K 6;"= TREE": PRINT AT 14,10; IN
```

```
K 7;"c": PRINT AT 14,12; INK 6;"
= SWAMP": PRINT AT 16,10; INK 0;
"d": PRINT AT 16,12; INK 6;"= LA
RGE HOLE": PRINT AT 18,9; INK 6;
"'0'= MORE HAMPERS ": PRINT AT 2
0,0; INK 6;"YOU MAY PRESS '0' TO
 GET MORE LUNCH BUT YOU LOUSE 5
POINTS"
  11  IF INKEY$="" THEN  GO TO 1
1: GO TO 12
  12 FOR z=-40 TO 50 STEP 1
  13 BEEP 0.005,z
  14 NEXT z
  15 LET L=3: LET R=1
  16 PAUSE 150: BORDER 2: PAPER
2: CLS
  17 GO SUB 8000
  20 INK 6: PLOT 0,0: DRAW 0,175
: DRAW 255,0: DRAW 0,-175: DRAW
-255,0
  25 INK 6: PLOT 127,16: DRAW 0,
-16
  30 INK 6: PLOT 0,159: DRAW 255
,0
  35 PRINT AT 20,7; INK 7;"LIVES
"
  40 PRINT AT 1,1; INK 7;"SCORE"
  45 PRINT AT 20,17 ; INK 7;"ROU
ND"
  47 PRINT AT 20,23; INK 7;"1"
  50 PRINT AT 1,14; INK 7;"HI RO
UND"
  60 INK 6: PLOT 2,16: DRAW 0,14
1: DRAW 251,0: DRAW 0,-141: DRAW
 -251,0
  61 PRINT AT 1,23; INK 7;H
  63 GO SUB 4000
  65 LET S=0
  70 LET A=10
  80 LET B=10
  90 LET A$=INKEY$
  95 BEEP 0.002,0+S
 100 IF A$="5" THEN  BEEP 0.002,
20: PRINT AT A,B;" ": LET B=B-1
 110 IF A$="8" THEN  BEEP 0.002,
20: PRINT AT A,B;" ": LET B=B+1
 120 IF A$="6" THEN  BEEP 0.002,
30: PRINT AT A,B;" ": LET A=A+1
 130 IF A$="7" THEN  BEEP 0.002,
30: PRINT AT A,B;" ": LET A=A-1
 140 IF B=31 THEN  BEEP 0.05,10:
 LET B=B-30
 142 IF INKEY$="0" THEN  BEEP 0.
09,0: LET S=S-5: GO SUB 4000
 145 IF B=0 THEN  BEEP 0.05,10:
LET B=B+30
 150 IF A=19 THEN  BEEP 0.05,10:
 LET A=A-16
 160 IF A=2 THEN  BEEP 0.05,10:
LET A=A+16
 170 IF ATTR (A,B)=17 THEN  BEEP
 0.01,30: LET S=S+5: GO SUB 4000
 : IF R>=9 THEN  GO SUB 5910
 180 IF ATTR (A,B)=20 THEN  BEEP
 0.2,-10: LET S=S-2: IF R>=9 THE
N  GO SUB 5910
 190 IF ATTR (A,B)=16 THEN  GO S
UB 5060: LET S=S-30
 197 IF ATTR (A,B)=23 THEN  BEEP
 0.2,30: LET S=S-10: IF R>=9 THE
N  GO SUB 5910
 200 LET C=(RND*27)+2
 210 LET D=(RND*13)+4
 220 PRINT AT D,C; INK 4;"a"
 999 PRINT AT 1,7;S
1000 PRINT AT A,B; INK 6;"e"
1005 PRINT AT 20,23; INK 7;R
1010 IF S<=30 THEN  PRINT AT 1,7
; INK 7;INT S
1020 IF S<=-1 THEN  LET L=L-1: B
EEP 0.25,10: BEEP 0.5,-10: GO TO
 16
1030 IF S>=30 THEN  LET R=R+1: C
LS : BORDER 1: PAPER 1: CLS : PR
INT AT 10,2; INK 6;"YOU ARE NOW
ON ROUND ": PRINT AT 10,24;R: BE
EP 0.2,0: GO TO 16
1050 IF L<=0 THEN  GO SUB 5000
1060 IF R<=H THEN  LET H=H
1070 IF R>=H THEN  LET H=R
1075 IF R>=3 THEN  GO SUB 7000
1080 IF R>=15 THEN  GO SUB 5910
1500 IF L=3 THEN  PRINT AT 20,1;
 INK 6;"e e e"
1510 IF L=2 THEN  PRINT AT 20,1;
 INK 6;"e e  "
1520 IF L=1 THEN  PRINT AT 20,1;
 INK 6;"e    "
2000 GO TO 90
4000 LET E=(RND*29)+1
4010 LET F=(RND*15)+3
4020 PRINT AT F,E; INK 1;"b"
4030 RETURN
5000 BEEP 0.5,0: BEEP 0.5,10: BE
EP 0.5,0: BORDER 0: PAPER 0: CLS
 : PRINT AT 7,11; INK 6; FLASH 1
; BRIGHT 1;"GAME OVER": PRINT AT
 0,10; INK 7;"HI ROUND ": PRINT
AT 0,20; INK 7; FLASH 1;H
5010 PRINT AT 15,7; INK 5;"ANOTH
ER GAME (Y/N)"
5020 IF INKEY$<>"y" THEN  GO TO
5020
5030 IF INKEY$="y" THEN  PAUSE 1
50: GO TO 2
5050 GO TO 5000
5060 FOR w=50 TO -20 STEP -1
5070 BEEP 0.005,w
5080 NEXT w
5100 BEEP 0.5,-40
5910 LET I=(RND*27)+2
5920 LET J=(RND*13)+4
6000 PRINT AT J,I; INK 0;"d"
6010 RETURN
7000  LET K=(RND*27)+2
7010 LET M=(RND*13)+4
7020 PRINT AT M,K; INK 7;"c"
7030 GO TO 1080
8000 POKE USR "a",BIN 00011000
8010 POKE USR "a"+1,BIN 00111100
8020 POKE USR "a"+2,BIN 01111110
8030 POKE USR "a"+3,BIN 11111111
8040 POKE USR "a"+4,BIN 01111110
8050 POKE USR "a"+5,BIN 00011000
8060 POKE USR "a"+6,BIN 00011000
8070 POKE USR "a"+7,BIN 00011000
8080 POKE USR "b",BIN 00011000
8090 POKE USR "b"+1,BIN 00011000
8100 POKE USR "b"+2,BIN 00011000
8120 POKE USR "b"+3,BIN 11111111
8130 POKE USR "b"+4,BIN 11111111
8140 POKE USR "b"+5,BIN 11111111
8150 POKE USR "b"+6,BIN 01111110
8160 POKE USR "b"+7,BIN 00111100
8170 POKE USR "c",BIN 00000000
8180 POKE USR "c"+1,BIN 00011000
8190 POKE USR "c"+2,BIN 10011001
8200 POKE USR "c"+3,BIN 11011011
8210 POKE USR "c"+4,BIN 01111110
8220 POKE USR "c"+5,BIN 00111100
8230 POKE USR "c"+6,BIN 00011000
8240 POKE USR "c"+7,BIN 11111111
8250 POKE USR "d",BIN 00111100
8260 POKE USR "d"+1,BIN 01111110
8270 POKE USR "d"+2,BIN 11111111
8280 POKE USR "d"+3,BIN 11111111
8290 POKE USR "d"+4,BIN 11111111
8300 POKE USR "d"+5,BIN 11111111
8310 POKE USR "d"+6,BIN 01111110
8320 POKE USR "d"+7,BIN 00111100
8330 POKE USR "e",BIN 00111100
8340 POKE USR "e"+1,BIN 01111110
8350 POKE USR "e"+2,BIN 10011001
8360 POKE USR "e"+3,BIN 11111111
8370 POKE USR "e"+4,BIN 11111111
8380 POKE USR "e"+5,BIN 11011011
8390 POKE USR "e"+6,BIN 01000010
8400 POKE USR "e"+7,BIN 00111100
9999 RETURN
```



NESSIE



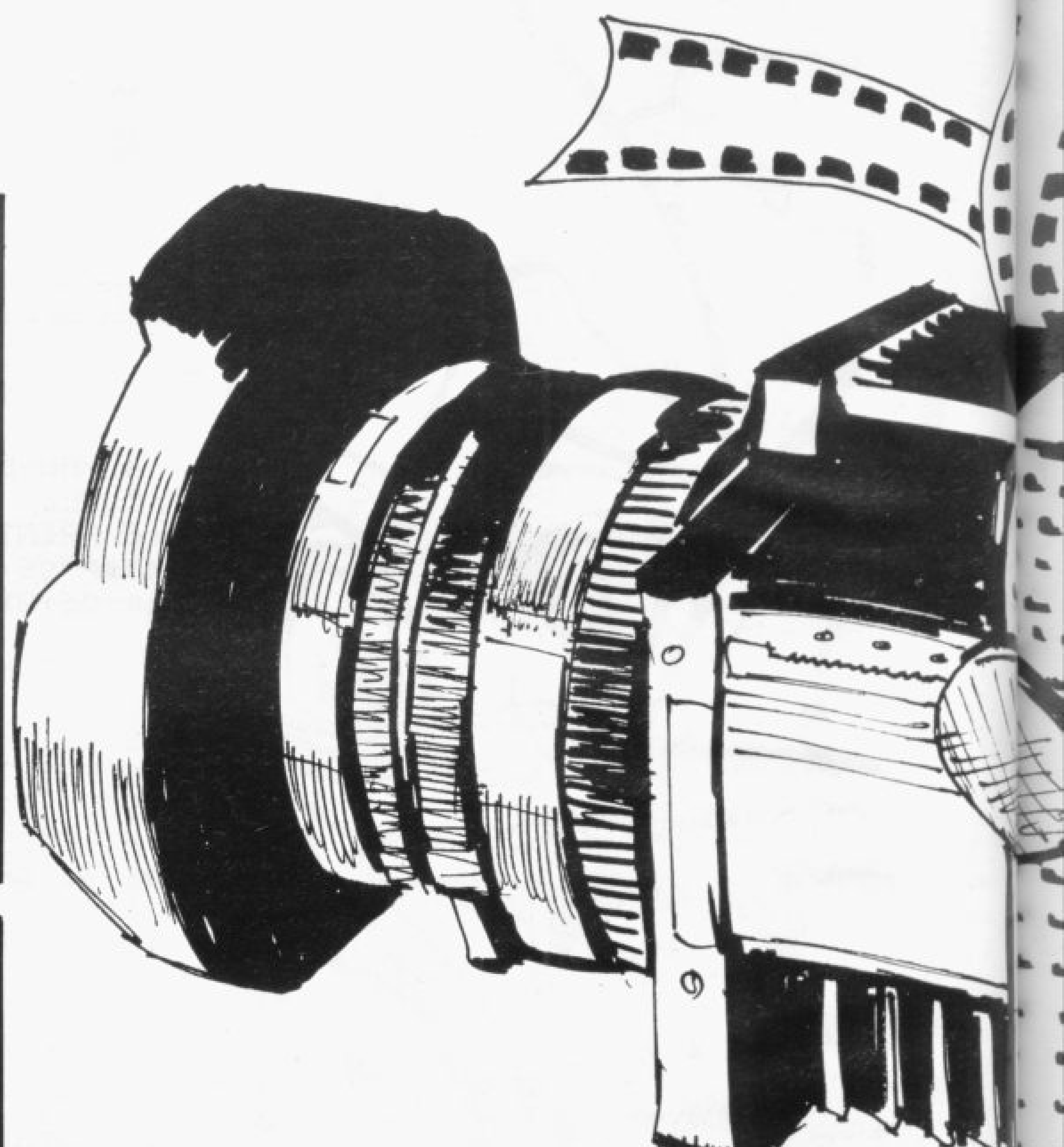

```
w   1 CLS
    2 LET T=CODE " "
    3 LET S=CODE " "
    4 PAUSE CODE "M"
    5 CLS
    6 PRINT AT CODE "$",CODE " ";
"(4*sP:96:3*isP:96:sP:96:3*isP:9
6:sP:96:3*isP:96:sP:96:3*isP:96)
"
    7 LET N=INT (RND*CODE "(94)"+
CODE "(91)")
    8 LET N=N*CODE "(9t)"
    9 PRINT AT CODE "£",N;"(9a)";
AT VAL "11",N-CODE "(91)";"(3*9f
)";AT CODE "(9s)",N-CODE "(91)";
"(9e:9a:9r)";AT CODE "(9d)",N-CO
DE "(91)";"(3*9a)"
   10 FOR I=CODE "(91)" TO INT (R
ND*CODE "(95)"+CODE "(91)")
   11 LET M$=INKEY$
   12 IF M$<>"" THEN GOTO CODE "?
"
   13 NEXT I
   14 GOTO CODE "("
   15 IF M$="1" AND N=CODE "(9t)"
 OR M$="2" AND N=CODE "£" OR M$=
"3" AND N=CODE ">" OR M$="4" AND
 N=CODE "/" THEN GOTO CODE "<"
   16 CLS
   17 PRINT AT CODE " ",CODE "(9d
)";"NESSIE ESCAPES"
   18 GOTO CODE "-"
   19 CLS
   20 PRINT AT CODE " ",CODE "(9a
)";"NESSIE DESTROYED"
   21 LET S=S+CODE "(91)"
   22 LET T=T+CODE "(91)"
   23 IF T=CODE "(9s)" THEN PRINT
 AT CODE "(91)",CODE "(95)";"YOU
 DESTROYED ";S;" NESSIES"
   24 IF T=CODE "(9s)" THEN STOP
   25 GOTO CODE "(93)"
```

A LOCH NESS Monster will appear behind one of four rocks. Press the appropriate number before **Nessie** vanishes. Written for the 1K ZX-81 by Russell Wooberry of Farnham, Surrey.

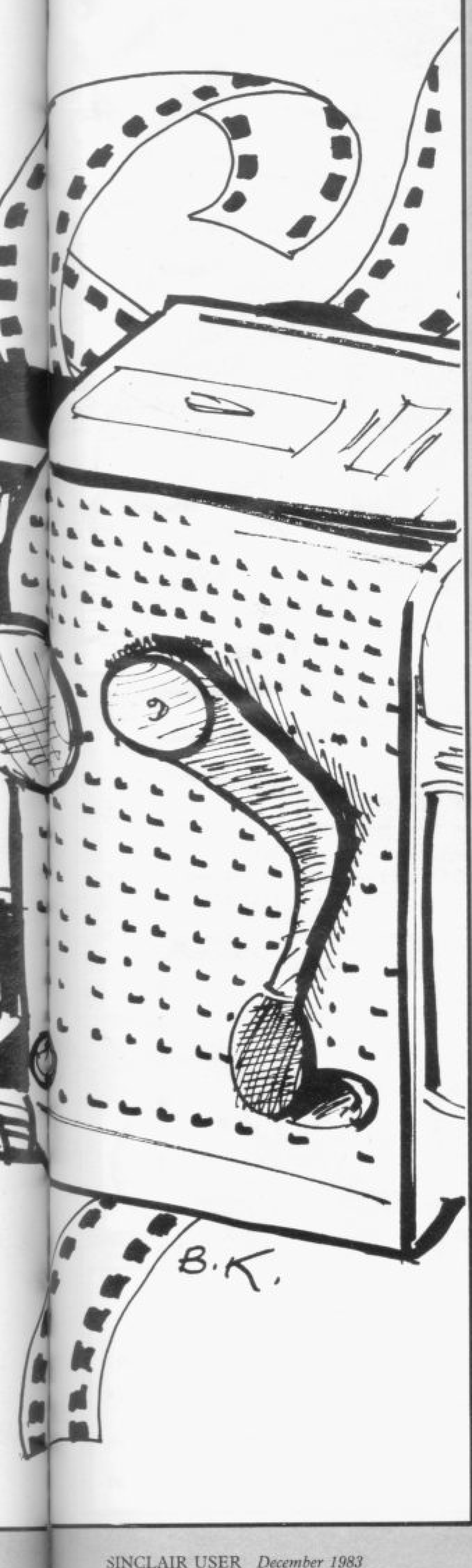
FILM FUN

YOU ARE a famous film director, determined to make as much money as possible from your next five films. The computer will ask how much money you would like to spend on equipment, cast and other essentials. Answers which are too low will not be accepted; for example, at least £5,000 must be spent on your cast. Other expenses will be incurred during production if you did not spend sufficient money initially.

Film Fun was written for the 16K ZX-81 by Paul Williams and Richard Oxborne of Manningtree, Essex.



```
  10 LET M=100000
  20 LET P=1
  30 LET D=0
  40 LET MO=0
  50 LET J=M
  60 LET RE=0
  90 GOTO 105
 100 FOR I=1 TO 100
 101 NEXT I
 105 LET MO=MO+1
 110 IF MO=6 THEN GOTO 8000
1110 FOR A=1 TO 10
1130 NEXT A
1400 PRINT AT 2,3;"FILM NUMBER:"
;MO
1500 PRINT AT 3,3;"MONEY:£";M;"
 ";AT 4,3;"POPULARITY:";P;"  ";A
T 5,3;"DEBT:£";D;"  "
1505 PRINT AT 6,3;"LOAN AVAILABL
E:£";J
1510 PRINT AT 8,3;"WHAT DO YOU W
ANT TO BUY ?"
2010 PRINT AT 11,3;"1)FILM CREW"
2020 PRINT AT 12,3;"2)CAST"
2030 PRINT AT 13,3;"3)FILM GRADE
"
2040 PRINT AT 14,3;"4)SPECIAL EF
FECTS"
2050 PRINT AT 15,3;"5)EQUIPMENT"
2060 PRINT AT 16,3;"6)INSURE £0
 £35000"
2110 INPUT CR
2115 IF CR<2000 THEN GOTO 2110
2116 PRINT AT 11,3;"(i1)"
2130 INPUT CA
2135 IF CA<5000 THEN GOTO 2130
```




```
2136 PRINT AT 12,3;"(i2)"
2145 INPUT FI
2149 IF FI<200 THEN GOTO 2140
2150 PRINT AT 13,3;"(i3)"
2170 INPUT EF
2175 PRINT AT 14,3;"(i4)"
2190 INPUT EQ
2195 IF EQ<4000 THEN GOTO 2190
2196 PRINT AT 15,3;"(i5)"
2210 INPUT IN
2215 IF IN<>35000 AND IN<>0 THEN
 GOTO 2210
2216 PRINT AT 16,3;"(i6)"
2217 GOSUB 5600
2220 LET M=M-(CR+FI+IN+CA+EF+EQ)
2223 FOR X=1 TO 4
2230 GOSUB 6500
2259 LET O=13
2260 IF RND>.9 THEN GOTO 5200
2270 IF CR<9540 AND RND>.6 THEN
GOTO 5300
2280 IF CA<20000 AND RND>.5 OR R
ND>.9 THEN GOTO 5400
2290 IF FI<1200 AND RND>.4 THEN
GOTO 5500
2300 IF EQ<10000 AND RND>.5 THEN
 GOTO 5700
2300~IF EQ<10000 AND RND>.5 THEN
 GOTO 5700
2310 PRINT AT 7+X,3;"ACT ";X;" C
OMPLETED"
2320 NEXT X
2900 GOSUB 5600
2910 GOSUB 6500
3000 PRINT AT 8,3;"YOUR FILM IS
FINISHED";AT 9,3;"HOW MUCH WILL
YOU PAY FOR";AT 10,3;"ADVERTISIN
G ?"
3010 INPUT AD
3014 GOSUB 5600
3015 LET M=M-AD
3016 GOSUB 6500
3020 LET SU=INT (((AD+FI+(CR/2)+
(CA*1.7)+(EF*1.7))*(P*.8))*RND)
3030 GOSUB 5600
3040 PRINT AT 9,3;"YOU FILM HAS
MADE A TOTAL";AT 10,3;"OF £";SU
3041 FOR I=1 TO 50
3042 NEXT I
3050 LET M=M+SU
3052 IF D>0 THEN GOSUB 3200
3055 IF M>J THEN LET J=M
3056 LET P=P+INT (SU/(MO*25000))
3057 IF P>100 THEN LET P=100
3060 IF P=0 THEN LET P=1
3070 LET OS=INT (SU/50000)
3080 IF OS=0 THEN GOTO 100
3081 IF OS>6 THEN LET OS=6
3082 GOSUB 5600
3083 LET RE=RE+OS
3085 PRINT AT 7,3;"OSCARS"
3090 FOR I=1 TO OS
3100 PRINT AT 9,I*4;" O  ";
3110 PRINT AT 10,I*4;"((9h)) ";
3120 PRINT AT 11,I*4;" A  ";
3130 NEXT I
3140 GOTO 100
3200 IF M>D THEN GOTO 3250
3210 LET D=D-M
3220 LET M=0
3230 RETURN
3250 LET M=M-D
3255 LET D=0
3260 RETURN
5200 PRINT AT 13,3;"THERE HAS BE
EN A FIRE.."
5205 IF IN<>0 THEN GOTO 5280
5210 LET DA=INT (RND*95000)+5000
5220 PRINT AT 15,3;"THE FIRE HAS
 CAUSED £";DA;AT 16,3;"OF DAMAGE
."
5230 LET M=M-DA
5240 GOTO 5285
5280 PRINT AT 15,3;"YOU ARE INSU
RED SO CAN";AT 16,3;"CONTINUE MA
KING YOUR FILM"
5285 FOR I=1 TO 100
5286 NEXT I
5287 GOSUB 5605
5290 GOTO 2270
5300 PRINT AT 13,3;"CREW GO ON S
TRIKE";AT 14,3;"THEY WANT A PAY
RISE"
5310 PRINT AT 16,3;"HOW MUCH EXT
RA ?"
5319 LET PR=0
5320 INPUT EX
5330 IF EX<=PR THEN GOTO 5320
5340 LET PR=EX
5350 IF (RND*2500)>EX THEN GOTO
5320
5360 LET CR=CR+EX
5370 LET M=M-EX
5375 GOSUB 5605
5390 GOTO 2280
5400 PRINT AT 13,3;"THE CAST GO
ON STRIKE";AT 14,3;"THEY WANT A
PAY RISE"
5410 PRINT AT 16,3;"HOW MUCH EXT
RA ?"
5415 LET PR=0
5420 INPUT EX
5430 IF EX<=PR THEN GOTO 5420
5440 LET PR=EX
5450 IF (RND*5000)>EX THEN GOTO
5420
5460 LET CA=CA+EX
5470 LET M=M-EX
5480 GOSUB 5605
5490 GOTO 2290
5500 PRINT AT 13,3;"THE FILM YOU
 BOUGHT WAS";AT 14,3;"CHEAP AND
DID NOT DEVELOPE"
5510 PRINT AT 16,3;"HOW MUCH WIL
L YOU PAY FOR ";AT 17,3;"NEW FIL
M ?"
5520 INPUT EX
5530 IF EX<200 THEN GOTO 5520
5540 LET FI=EX
5550 LET M=M-FI
5555 GOSUB 5605
5560 GOTO 2300
5600 LET O=7
5605 FOR I=17 TO O STEP -1
5610 PRINT AT I,3;"
                    "
5620 NEXT I
5630 RETURN
5700 PRINT AT 13,3;"YOU BOUGHT C
HEAP EQUIPMENT";AT 14,3;"AND IT
BROKE"
5710 PRINT AT 16,3;"HOW MUCH WIL
L YOU PAY FOR";AT 17,3;"NEW EQUI
PMENT ?"
5720 INPUT EX
5730 IF EX<4000 THEN GOTO 5720
5740 LET EQ=EX
5750 LET M=M-EQ
5755 GOSUB 5605
5760 GOTO 2301
5999 STOP
6510 LET D=D+INT (D/15)
6520 IF M<0 THEN LET D=D+ABS M
6530 IF M<0 THEN LET M=0
6540 PRINT AT 3,10;M;"          "
6550 PRINT AT 5,9;D;"           "
6555 IF D>J THEN GOTO 6580
6570 RETURN
6580 GOSUB 5600
6590 PRINT AT 9,3;"YOU EXCEEDED
HIGHEST LOAN";AT 10,3;"AVAILABLE
,YOU ARE BROKE"
6600 FOR T=1 TO 100
6610 NEXT T
7000 GOSUB 5600
7010 PRINT AT 9,3;"DO YOU WANT A
NOTHER GAME?"
7020 INPUT A$
7030 IF A$="Y" OR A$="YES" THEN
RUN
8000 LET O=2
8010 GOSUB 5605
8020 PRINT AT 3,5;"FILM-FUN CERT
IFICATE";AT 4,5;"(20*97)"
8030 PRINT AT 6,3;"NAME:SPEVEN S
TIELBERG"
8040 PRINT AT 8,3;"FILMS MADE:5"
8050 PRINT AT 10,3;"OSCARS:";RE
8060 PRINT AT 12,3;"POPULARITY:"
;P
8065 PRINT AT 14,3;"MONEY:£";M
8070 PRINT AT 16,3;"SCORE:";INT
(((M-D)/1000)*(RE*P)/1000)
9997 STOP
9998 SAVE "FILM-FUn"
9999 RUN
```

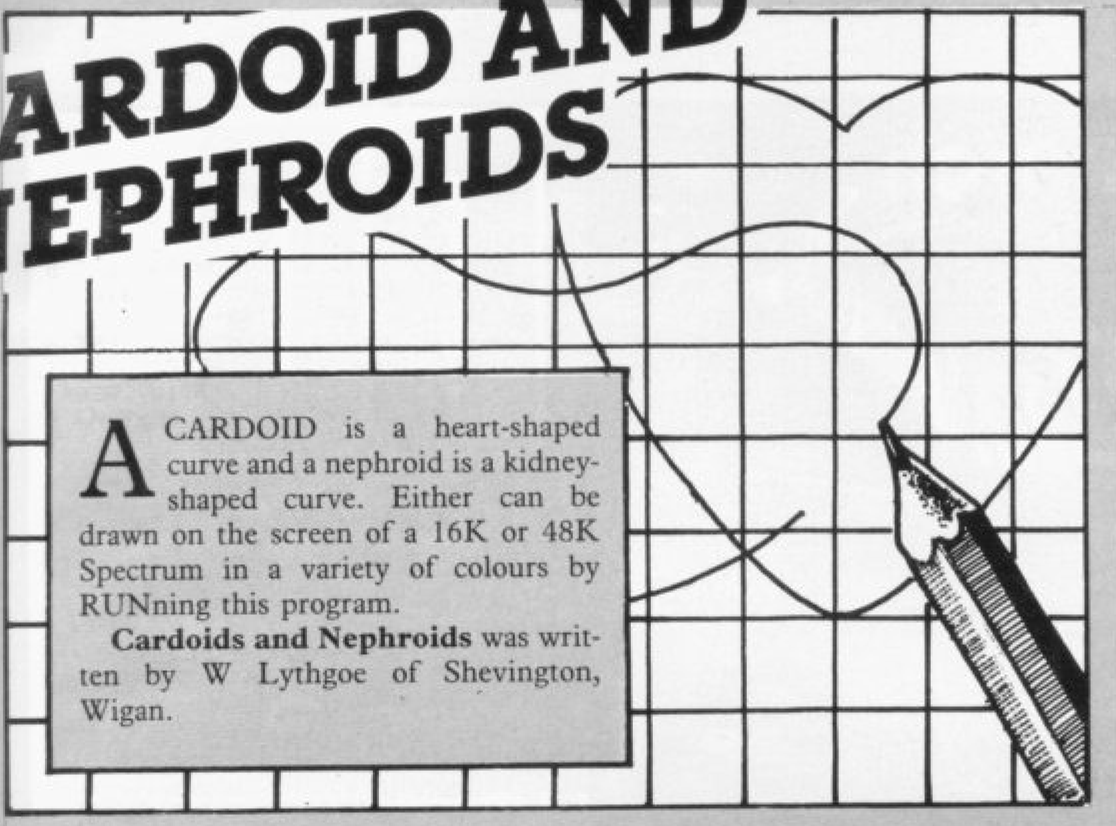
CHRISTMAS GIFT TAGS



JONATHAN COURT of Poole, Dorset, used this program last year to produce all his **Christmas Gift Tags.** Input the number of tags required. The computer will print one on the screen and then provide the requested number of copies. The program will run on a 16K ZX-81 with printer.

```
  10 CLS
  20 PRINT AT 8,6;"HOW MANY GIFT
 TAGS";AT 10,7;"WOULD YOU LIKE ?
"
  30 INPUT N
  40 IF N<1 OR N<>INT N THEN GOT
O 30
  50 CLS
  60 PRINT ,"
  70 PRINT ,"
  80 PRINT ,"
  90 PRINT ,"
 100 PRINT ,"
 110 PRINT ,"
 120 PRINT ,"
 130 PRINT ,"
 140 PRINT ,"
 150 PRINT ,"
 160 PRINT ,"
 170 PRINT ,"
 180 PRINT ,"
 190 PRINT ,"
 200 PRINT ,"
 210 PRINT ,"
 220 PRINT ,"
 230 PRINT ,"
 240 PRINT ,"
 250 PRINT ,"
 260 PRINT ,"
 270 PRINT ,"
 280 FOR A=1 TO N
 290 COPY
 300 NEXT A
 310 GOTO 10
 320 SAVE "XMAS GIFT TA■"
 330 GOTO 10
```





CARDOID AND NEPHROIDS

A CARDOID is a heart-shaped curve and a nephroid is a kidney-shaped curve. Either can be drawn on the screen of a 16K or 48K Spectrum in a variety of colours by RUNning this program.

Cardoids and Nephroids was written by W Lythgoe of Shevington, Wigan.

```
   5 BORDER 4: PAPER 7: CLS
  10 PRINT AT 0,3; INK 2;"CARDIO
IDS and NEPHRUIDS"
  20 PRINT INK 1;''" A cardioid
is a heart-shaped    curve."''"
A nephroid is a kidney-shaped
curve."''" Both curves are made
up by       drawing a set of circ
les.";'''''' FLASH 1;"   Press a
ny key to continue.   "
  22 PAUSE 0
  25 FOR n=0 TO 24: BEEP .01,n:
NEXT n: CLS
  30 PRINT INK 1;'" If you want
to draw a cardioid  ENTER c."''"
 If you want to draw a nephroid
 ENTER n."
  32 INPUT P$
  35 IF P$<>"c" AND P$<>"n" THEN
 GO TO 32
  37 FOR n=0 TO 24: BEEP .01,n:
NEXT n: CLS
  40 IF P$="c" THEN PRINT INK 2;
''" ENTER a number from 1 to 10
to  set the shape of the cardioi
d."
  42 IF P$="n" THEN PRINT INK 2;
''" ENTER a number from 1 to 10
to  set the shape of the nephroi
d."
  43 INPUT a
  45 IF a<1 OR a>10 THEN GO TO 4
3
  50 PRINT INK 1;''" ENTER a num
ber from 1 to 5 to   set the num
ber of circles (1    draws a few
 circles; 5 draws a  lot)."
  55 FOR n=0 TO 24: BEEP .01,n:
NEXT n
  60 INPUT b
  70 IF b<1 OR b>5 THEN GO TO 60
  80 PRINT INK 2;''" ENTER a num
ber from 0 to 6 to   set the col
our."
  85 FOR n=0 TO 24: BEEP .01,n:
NEXT n
  90 INPUT c
 100 IF c>6 THEN GO TO 90
 105 INK c: CLS
 110 FOR x=108 TO 148 STEP (6-b)
 120 LET y=88+SQR (20*20-((x-128
)*(x-128)))
 130 IF P$="c" THEN CIRCLE x,y,S
QR ((x-128)*(x-128)+(y-(35+a*10)
)*(y-(35+a*10)))
 132 IF P$="n" THEN CIRCLE x,y,(
y-(35+a*10))
 135 BEEP .3,x-120
 140 LET y=88-SQR (20*20-((x-128
)*(x-128)))
 150 IF P$="c" THEN CIRCLE x,y,S
QR ((x-128)*(x-128)+(y-(35+a*10)
)*(y-(35+a*10)))

 150>IF P$="c" THEN CIRCLE x,y,S
QR ((x-128)*(x-128)+(y-(35+a*10)
)*(y-(35+a*10)))
 152 IF P$="n" THEN CIRCLE x,y,(
y-(35+a*10))
 155 BEEP .3,x-120
 160 NEXT x
 170 STOP
```



PILOT your **Orion Shuttle** through the galaxy, using cursor keys 5 and 6. If you hit a star your score will be displayed and you should press NEWLINE to play again. If you succeed in crossing the screen, press NEWLINE to continue your flight.

Written for the 1K ZX-81 by Russell Wooberry of Farnham, Surrey.

ORION SHUTTLE

```
   1 LET S=CODE " "
   2 CLS
   3 FAST
   4 FOR I=CODE "(91)" TO CODE "
(9a)"
   5 PRINT AT I,CODE " ";"(32*is
p)"
   6 NEXT I
   7 FOR I=CODE "(91)" TO CODE "
7"
   8 PRINT AT RND*CODE "(9e)"+CO
DE "(91)",RND*CODE ".";"(i*)"
   9 NEXT I
  10 SLOW
  11 PAUSE CODE "M"
  12 LET X=RND*CODE "(9e)"+CODE
"(91)"
  13 LET Y=CODE "3"
  14 PRINT AT X,Y-CODE "(91)";
  15 IF PEEK (PEEK 16398+256*PEE
K 16399)<>128 THEN GOTO CODE ";"
  16 LET S=S+CODE "(91)"
  17 PRINT AT X,Y;"(isP)"
  18 IF INKEY$="7" THEN LET X=X-
CODE "(91)"
  19 IF INKEY$="6" THEN LET X=X+
CODE "(91)"
  20 LET Y=Y-CODE "(91)"
  21 PRINT AT X,Y;"(1<)"
  22 IF Y=CODE " " THEN GOTO COD
E "(92)"
  24 GOTO CODE ":"
  25 PRINT S
  26 INPUT X$
  27 RUN
```

black hole search

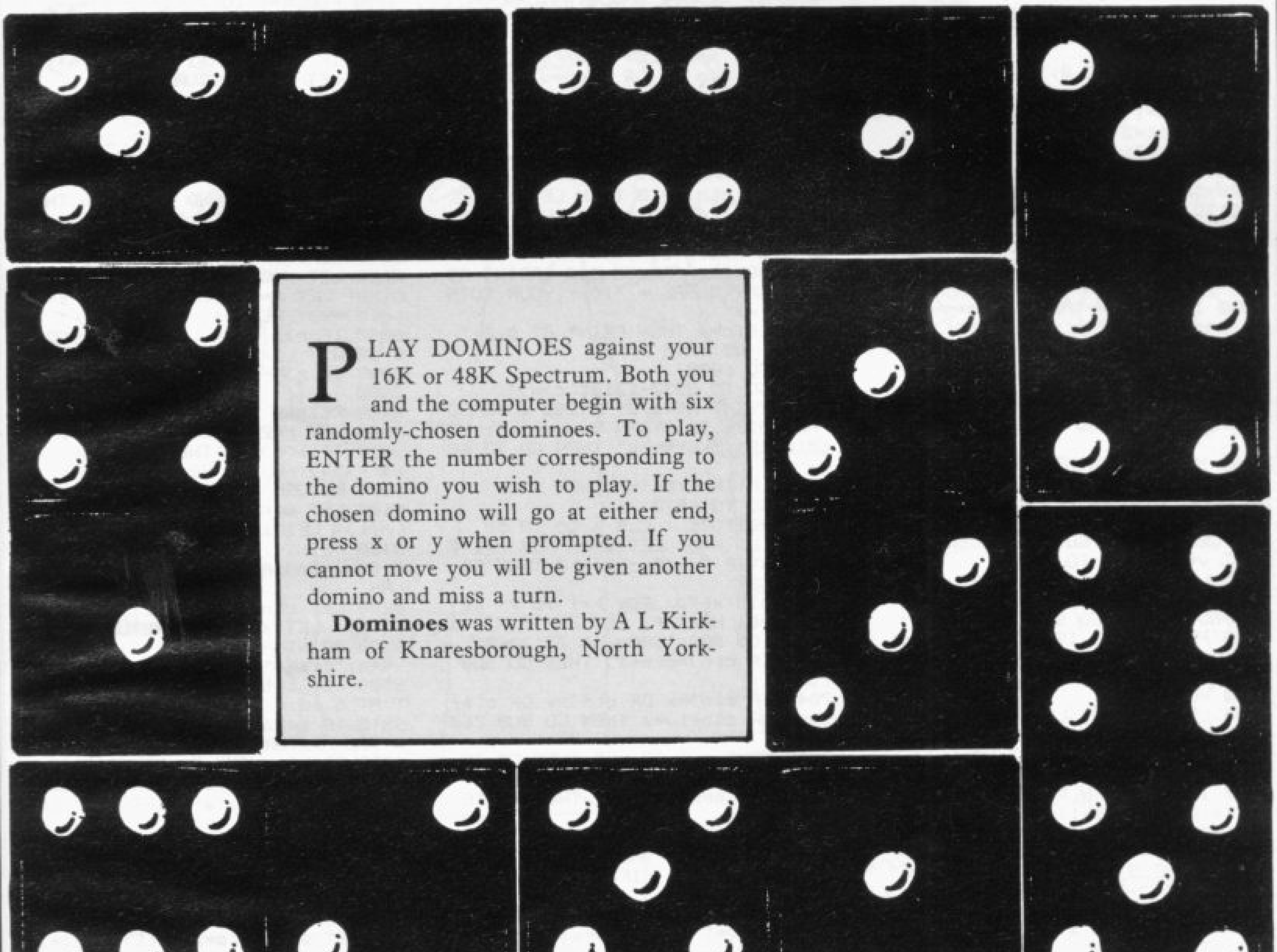


YOU are lost in space, and must attempt to return to Earth through a series of black holes. Black holes pulse for only a short time and so their position must be memorised. The heat from a star will send your controls haywire and the number of stars increases with each black hole. A further complication is that you are short of oxygen.

Black Hole Search was written for the 16K Spectrum by G H Allen of Kings Heath, Birmingham.

```
  10 FOR j=0 TO 7
  20 READ a: POKE USR "U"+j,a
  30 NEXT j
  40 DATA 24,60,126,219,219,36,6
6,102
  50 FOR h=0 TO 7
  60 READ b: POKE USR "T"+h,b
  70 NEXT h
  80 DATA 102,66,36,219,219,126,
60,24
  90 FOR g=0 TO 7
 100 READ c: POKE USR "S"+g,c
 110 NEXT g
 120 DATA 24,220,166,31,31,166,2
20,24
 130 FOR e=0 TO 7
 140 READ d: POKE USR "R"+e,d
 150 NEXT e
 160 DATA 24,59,101,248,248,101,
59,24
 200 PAPER 6
 210 BORDER 1
 220 INK 0
 230 CLS
 240 PRINT AT 2,7;"BLACK HOLE SE
ARCH"
 250 PRINT AT 4,2;"STATUS:Lost i
n space"
 260 PRINT AT 5,1;"MISSION:Retur
n to Earth"
 270 PRINT AT 6,9;"through a ser
ies of"
 280 PRINT AT 7,9;"Black Holes"
 290 PRINT AT 8,2;"ADVICE:Black
Holes only pulse"
 300 PRINT AT 9,9;"for a short t
ime, you"
 310 PRINT AT 10,9;"must remembe
r where it"
 320 PRINT AT 11,9;"is. Avoid he
at of"
 330 PRINT AT 12,9;"stars, as th
is will"
 340 PRINT AT 13,9;"throw you of
f course"
 350 PRINT AT 14,1;"PROBLEM:Only
 100 seconds of"
 360 PRINT AT 15,9;"oxygen left"
 361 PRINT AT 19,8; FLASH 1;"Pre
ss any key": PAUSE 0
 363 CLS
 365 PAPER 6
 367 BORDER 1
 370 INK 0
 372 PRINT AT 2,0;"CONTROLS:z ro
tates craft"
 374 PRINT AT 3,9;"x forward thr
ust"
 376 PRINT AT 4,9;"e causes the
Black"
 378 PRINT AT 5,9;"Hole to pulse
"
 380 PRINT AT 6,3;"SCORE:2 for e
ach"
 382 PRINT AT 7,9;"Black Hole"
 384 PRINT AT 8,9;"-1 each press
 of e"
 386 PRINT AT 15,2; FLASH 1;"Rea
dy to start? Press any key": PAU
SE 0
 388 CLS
 390 POKE 23674,0: POKE 23673,0:
 POKE 23672,0
 400 PAPER 0: BORDER 0: CLS
 410 LET sc=0: LET sd=0
 420 FOR s=1 TO INT (RND*3)+1: P
RINT AT RND*20,RND*29; INK 3; BR
IGHT 1;"*": NEXT s
 430 LET a=2+INT (RND*10): LET b
=2+INT (RND*10): PRINT AT a,b; I
NK 6;CHR$ 164: LET t=1
 440 LET d=2+INT (RND*18): LET o
=2+INT (RND*28): PRINT AT d,o; I
NK 7;"(isp )": BEEP .45,10: BEEP
 .35,20: FOR h=1 TO 40: NEXT h: P
RINT AT d,o;" "
 450 LET m=(PEEK 23672+256*PEEK
23673+65536*PEEK 23674)/5
 460 PRINT AT 0,0; INK 7;INT m/1
0
 470 IF INT m>1000 THEN  GO TO 7
00
 480 IF INKEY$="z" AND t=1 THEN
 PRINT AT a,b; INK 6;CHR$ 162: L
ET t=2: BEEP .1,-20: FOR h=1 TO
20: NEXT h
 490 IF INKEY$="z" AND t=2 THEN
 PRINT AT a,b; INK 6;CHR$ 163: L
ET t=3: BEEP .1,-20: FOR h=1 TO
20: NEXT h
 500 IF INKEY$="z" AND t=3 THEN
 PRINT AT a,b; INK 6;CHR$ 161: L
ET t=4: BEEP .1,-20: FOR h=1 TO
20: NEXT h
 510 IF INKEY$="z" AND t=4 THEN
 PRINT AT a,b; INK 6;CHR$ 164: L
ET t=1: BEEP .1,-20: FOR h=1 TO
20: NEXT h
 520 IF INKEY$="x" AND t=1 AND a
>2 THEN  PRINT AT a,b;" ": BEEP
.01,20: LET a=a-1: PRINT AT a,b;
 INK 6;CHR$ 164
 530 IF INKEY$="x" AND t=2 AND b
<29 THEN  PRINT AT a,b;" ": BEEP
 .01,20: LET b=b+1: PRINT AT a,b
; INK 6;CHR$ 162
 540 IF INKEY$="x" AND t=3 AND a
<19 THEN  PRINT AT a,b;" ": BEEP
 .01,20: LET a=a+1: PRINT AT a,b
; INK 6;CHR$ 163
 550 IF INKEY$="x" AND t=4 AND b
>2 THEN  PRINT AT a,b;" ": BEEP
.01,20: LET b=b-1: PRINT AT a,b;
 INK 6;CHR$ 161
 560 IF ATTR (a-1,b)=67 OR ATTR
(a,b+1)=67 OR ATTR (a+1,b)=67 OR
 ATTR (a,b-1)=67 THEN  PRINT AT
a,b;" ": BEEP .1,-10: LET a=a-IN
T (RND*2): LET b=b-INT (RND*2):
PRINT AT a,b; INK 6;CHR$ 161: BE
EP .1,-10: LET t=4
 570 IF a=d AND b=o THEN  PRINT
AT a,b; PAPER 1; INK 4; BRIGHT 1
;"£": FOR h=1 TO 40: NEXT h: FOR
 i=1 TO 20: BEEP .05,25-i: NEXT
i: PRINT AT a,b;" ": LET sc=sc+2
: GO TO 420
 575 IF INKEY$="e" THEN  PRINT A
T d,o; INK 2;"(isp )": BEEP .40,1
5: FOR h=1 TO 40: NEXT h: PRINT
AT d,o;" ": LET sd=sd+1
 580 GO TO 450
 700 FOR e=1 TO 2: FOR g=1 TO 6
 710 PAPER g
 720 BORDER g+1
 730 CLS
 740 BEEP .05,20: BEEP .05,20: B
EEP .05,0
 750 PRINT AT 3,7;"OUT OF OXYGEN
"
 760 NEXT g: NEXT e
 770 BEEP 1,-10: BEEP 2,-5
 780 PRINT AT 10,2;"Black Hole S
core ";sc
 782 PRINT AT 11,5;"- e key pres
s ";sd
 785 PRINT AT 12,7;"Total score
";sc-sd
 790 INPUT "Another game(y/n)?";
b$
 800 IF b$="y" THEN  RUN
 810 IF b$="n" THEN  CLS : PRINT
 "I enjoyed our game, thank you"
: STOP
```

DOMINOES

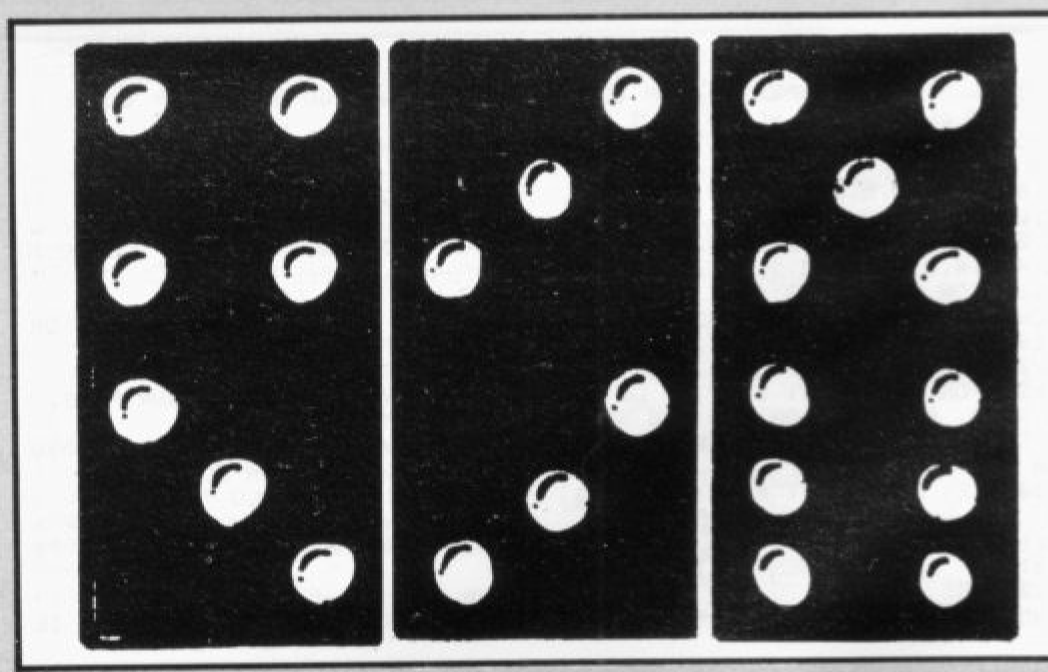


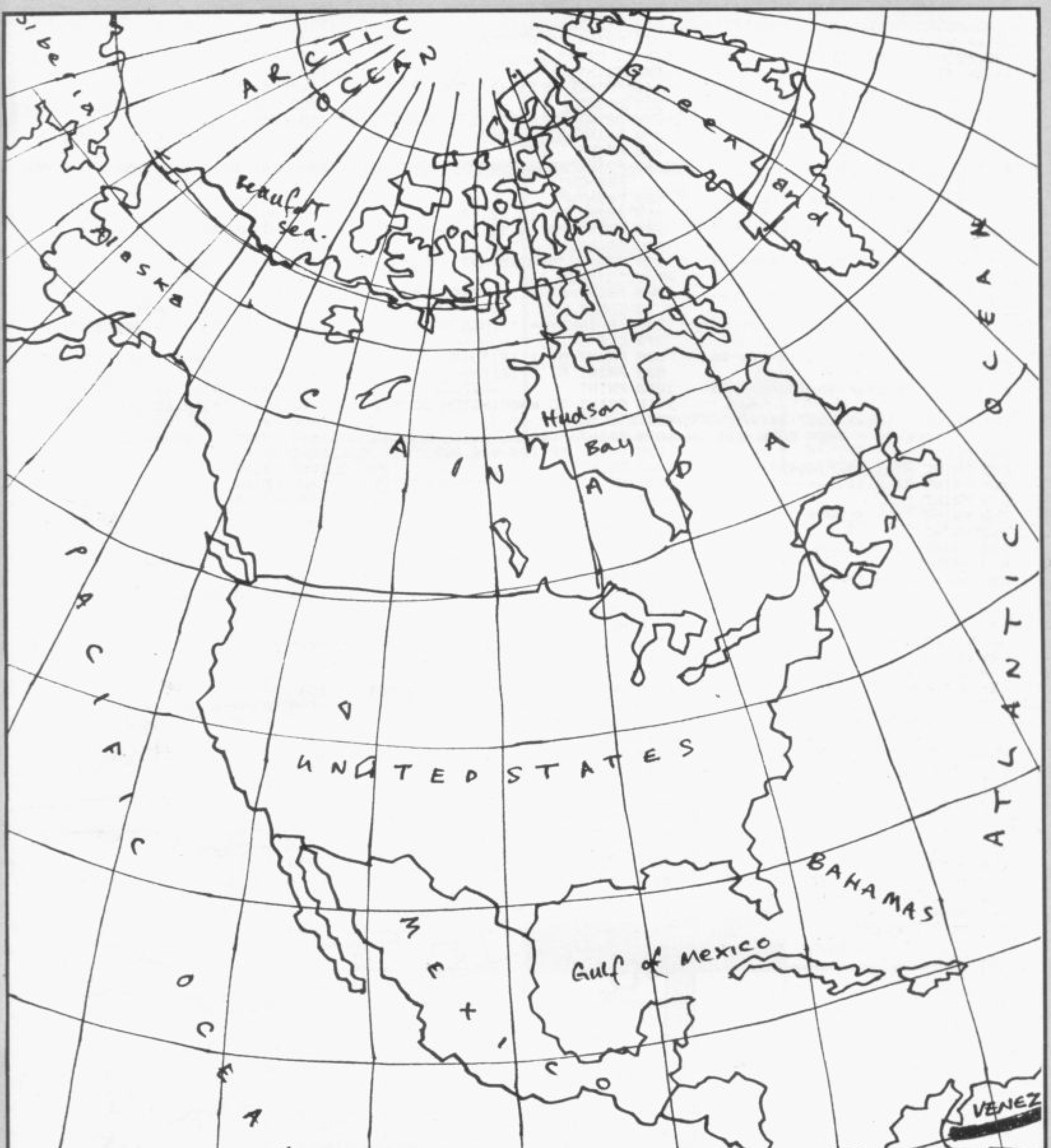
PLAY DOMINOES against your 16K or 48K Spectrum. Both you and the computer begin with six randomly-chosen dominoes. To play, ENTER the number corresponding to the domino you wish to play. If the chosen domino will go at either end, press x or y when prompted. If you cannot move you will be given another domino and miss a turn.

Dominoes was written by A L Kirkham of Knaresborough, North Yorkshire.

```
  50 BORDER 7: PAPER 7: DIM a(56
): DIM c(20): DIM m(20): FOR n=1
 TO 56: READ b: LET a(n)=b: NEXT
 n
  80 DATA 0,0,0,1,0,2,0,3,0,4,0,
5,0,6,1,1,1,2,1,3,1,4,1,5,1,6,2,
2,2,3,2,4,2,5,2,6,3,3,3,4,3,5,3,
6,4,4,4,5,4,6,5,5,5,6,6,6
 120 FOR n=1 TO 20: LET c(n)=10:
 LET m(n)=10: NEXT n: FOR n=1 TO
 19 STEP 2: PRINT AT 21,8+n;(n+1
)/2: NEXT n
 200 FOR n=1 TO 11 STEP 2: GO SU
B 9000: GO SUB 9100: GO SUB 9150
: GO SUB 9000: GO SUB 9200: GO S
UB 9250: NEXT n
 300 LET ct=6: LET mt=6: LET t=1
6: LET h=32: LET g=32: PRINT AT
5,16;16;" DOMS LEFT"
 310 IF RND>.5 THEN GO TO 400
 320 LET i=1: GO TO 640
 350 GO SUB 9650: LET a=m(w-1):
LET b=m(w): GO SUB 9600: GO TO 1
210
 400 PRINT AT 0,0;"
MY MOVE                 ": LET v=0: L
ET J=1: GO TO 7000
 420 LET a=c(n): LET b=c(n+1): G
O SUB 9600: GO SUB 9700: GO TO 6
00
 600 LET i=0: LET v=0
 605 FOR n=1 TO 20: IF m(n)=x OR
 m(n)=y THEN GO TO 640
 620 NEXT n: GO TO 800
 640 PRINT AT 0,0;"  YOUR MOVE.
PRESS NUMBER KEY    "
 650 INPUT q: LET w=2*q: IF q>10
 OR m(w-1)=10 THEN GO TO 640
 665 IF i=1 THEN GO TO 350
 670 IF m(w-1)=x AND m(w)=y OR m
(w-1)=y AND m(w)=x THEN GO TO 70
0
 680 LET n=w-1: GO TO 1000
 700 PRINT AT 0,0;" WHICH END IS
 IT TO GO x OR y   "
 710 GO TO 700+50*(INKEY$="x")+7
0*(INKEY$="y")
 750 GO TO 1000+10*(m(w)=x)
 770 GO TO 1020+10*(m(w)=y)
 800 IF t=0 AND v=2 THEN GO TO 5
000
 805 PRINT AT 0,0;"YOUR GO, BUT
YOU ARE KNOCKING!!!": PAUSE 150
 810 IF t=0 AND v<>2 THEN PRINT
AT 0,0;"  NO MORE DOMINOES LEFT
SO MY GO": LET v=v+1: GO TO 2005
 830 PRINT AT 0,0;"YOU WILL NOW
GET ANOTHER DOMINO ": PAUSE 150:
 LET mt=mt+1: GO SUB 9000
 870 FOR n=1 TO 19 STEP 2: IF m(
n)=10 THEN GO SUB 9100: GO SUB 9
150: GO SUB 9500: GO TO 2000
 880 NEXT n
1000 IF m(w-1)=x THEN GO SUB 245
0: GO TO 2500
1010 IF m(w)=x THEN LET z=m(w):
```

```
LET m(w)=m(w-1): LET m(w-1)=x: G
O SUB 2450: GO TO 2500
1020 IF m(w-1)=y THEN GO SUB 245
0: GO TO 2600
1030 IF m(w)=y THEN LET z=m(w):
LET m(w)=m(w-1): LET m(w-1)=z: G
O SUB 2450: GO TO 2600
1040 GO TO 640
1200 GO SUB 9650
1210 IF mt>0 THEN LET m(w-1)=10:
 LET m(w)=10: GO TO 2000
1220 PRINT AT 0,0; FLASH 1; BRIG
HT 1;"     WELL DONE. YOU HAVE W
ON    ": GO TO 6000
2000 LET v=0: LET J=0
2005 IF t=0 AND v=2 THEN GO TO 5
000
2006 PRINT AT 0,0;"             MY
 MOVE              "
2007 IF v=1 THEN GO SUB 8000
2008 IF ct=2 THEN GO SUB 4000
2009 IF ct>1 THEN GO TO 7000
2010 FOR n=1 TO 19 STEP 2
2020 IF c(n)=x THEN GO SUB 2400:
 GO TO 2500
2025 IF c(n)=y THEN GO SUB 2400:
 GO TO 2600
2040 NEXT n: FOR n=2 TO 20 STEP
2
2050 IF c(n)=x THEN LET n=n-1: L
ET z=c(n): LET c(n)=c(n+1): LET
c(n+1)=z: GO SUB 2400: GO TO 250
0
2060 IF c(n)=y THEN LET n=n-1: L
ET z=c(n): LET c(n)=c(n+1): LET
c(n+1)=z: GO SUB 2400: GO TO 260
0
2100 NEXT n: PRINT AT 0,0;"
    I AM KNOCKING           "
2110 PAUSE 150: IF t=0 AND v<>2
THEN PRINT AT 0,0;"NO MORE DOMIN
OES LEFT. YOUR GO  ": PAUSE 150:
 LET v=v+1: GO TO 605
2130 LET ct=ct+1: PRINT AT 0,0;"
I WILL NOW TAKE ANOTHER DOMINO
": PAUSE 100: GO SUB 9000
2160 FOR n=1 TO 19 STEP 2: IF c(
n)=10 THEN GO SUB 9200: GO SUB 9
250: GO SUB 9500: GO TO 600
2180 NEXT n
2400 LET a=c(n): LET b=c(n+1): L
ET l=1: RETURN
2450 LET a=m(w-1): LET b=m(w): L
ET l=2: RETURN
2500 IF g>0 THEN PRINT ; INK 7;
PAPER 0;AT 10,g-1;a;AT 10,g-2;b:
 PRINT AT 10,g-4;"x"
2510 IF g=0 THEN PRINT ; INK 7;
PAPER 0;AT 9,2;a;AT 8,2;b: PRINT
 AT 7,3;"x";AT 10,0;" "
2520 IF g<0 THEN PRINT ; INK 7;
PAPER 0;AT 7,-g;a;AT 7,1-g;b: PR
INT AT 7,3-g;"x"
2530 LET g=g-2: LET x=b: GO TO 2
900*(l=1)+1200*(l=2)
2600 IF h>0 THEN PRINT ; INK 7;
PAPER 0;AT 13,h-1;a;AT 13,h-2;b:
 PRINT AT 13,h-4;"y"
2610 IF h=0 THEN PRINT ; INK 7;
PAPER 0;AT 14,2;a;AT 15,2;b: PRI
NT AT 16,3;"y";AT 13,0;" "
2620 IF h<0 THEN PRINT ; INK 7;
PAPER 0;AT 16,-h;a;AT 16,1-h;b:
PRINT AT 16,3-h;"y"
2630 LET h=h-2: LET y=b: GO TO 2
900*(l=1)+1200*(l=2)
2900 GO SUB 9700: IF ct>0 THEN G
O TO 600
2930 PRINT AT 0,0; BRIGHT 1; FLA
SH 1;"     HARD LUCK. I HAVE WON
     ": GO TO 6000
4000 LET q=0
4010 LET z=y: LET d=x: FOR n=1 T
O 19 STEP 2
4020 LET e=1: IF c(n)=x THEN LET
 x=c(n+1): GO SUB 4500: GO TO 20
20+2010*(l=0)
4030 IF c(n)=y THEN LET y=c(n+1)
: GO SUB 4500: GO TO 2025+2015*(
l=0)
4040 LET e=0: IF c(n+1)=x THEN L
ET x=c(n): GO SUB 4500: GO TO 20
50+2000*(l=0)
4050 IF c(n+1)=y THEN LET y=c(n)
: GO SUB 4500: GO TO 2060+2000*(
l=0)
4060 NEXT n: IF q=1 THEN RETURN
4070 LET q=1: GO TO 4010
4500 FOR m=1 TO n-2 STEP 2: IF c
(m)<>10 THEN GO TO 4600+50*(q=1)
4540 NEXT m: FOR m=n+2 TO 19 STE
P 2: IF c(m)<>10 THEN GO TO 4600
+50*(q=1)
4550 NEXT m: LET l=0: GO TO 4610
4600 IF c(m)=x AND c(m+1)=y OR c
(m)=y AND c(m+1)=x THEN LET l=1:
 LET n=n+(e=0)
4610 LET x=d: LET y=z: RETURN
4650 IF c(m)=x OR c(m)=y OR c(m+
1)=x OR c(m+1)=y THEN LET l=1: L
ET n=n+(e=0): GO TO 4610
4660 LET l=0: GO TO 4610
5000 PAUSE 150: PRINT AT 0,0;"WE
 BOTH CANNOT GO. ADD UP SPOTS "
5030 IF c(n)<>10 THEN LET c=c+c(
n): IF n/2<>INT (n/2) THEN PRINT
 ; INK 7; PAPER 0;AT 2,8+n;c(n);
AT 3,8+n;c(n+1)
5050 NEXT n: PAUSE 200: PRINT AT
 5,0;"MY TOTAL = ";c;" YOUR TOTA
L = ";m;"         "
5080 IF c=m THEN PRINT AT 0,0;"
       WE HAVE DRAWN            "
: GO TO 6000
5090 GO TO 2930-1710*(c>m)
6000 PRINT AT 1,0;"PRESS y TO GO
 AGAIN. n TO STOP  "
6010 IF INKEY$="y" THEN GO TO 60
40
6020 IF INKEY$="n" THEN STOP
6030 GO TO 6010
6040 RESTORE : CLS : GO TO 50
7000 LET m=0: LET s=0: FOR n=1 T
O 19 STEP 2: IF c(n)=10 THEN GO
TO 7060
7020 DIM x(7): FOR p=1 TO 7: LET
 x(p)=0: NEXT p: LET c=0: IF J=1
 THEN GO SUB 7600: GO TO 7060
7035 IF c(n)=c(n+1) THEN GO SUB
7500
7040 IF c(n)=x OR c(n)=y OR c(n+
1)=x OR c(n+1)=y THEN GO SUB 760
0
7060 NEXT n : IF m=0 THEN GO TO
2100
7105 LET n=m: IF J=1 THEN GO TO
420
7110 IF c(n)=x THEN GO TO 2020
7120 IF c(n)=y THEN GO TO 2025
7130 LET n=n+1: IF c(n)=x THEN G
O TO 2050
7140 IF c(n)=y THEN GO TO 2060
7500 IF v=1 AND c(n)=x THEN GO T
O 2020
7510 IF v=1 AND c(n)=y THEN GO T
O 2025
7520 RETURN
7600 FOR q=1 TO n-1: GO SUB 7800
: NEXT q: FOR q=n+2 TO 20: GO SU
B 7800: NEXT q
7640 FOR u=1 TO 7: LET c=c+x(u):
 NEXT u: LET c=c+.5*(c(n)=c(n+1)
)
7650 IF c>s THEN LET m=n: LET s=
c
7660 IF c=s AND c>0 THEN GO SUB
7900
7670 RETURN
7800 FOR u=1 TO 7: IF c(q)=u-1 T
HEN LET x(u)=1
7820 NEXT u: RETURN
7900 IF c(n)+c(n+1)>c(m)+c(m+1)
THEN LET m=n: RETURN
7910 IF c(n)+c(n+1)<=c(m)+c(m+1)
 THEN RETURN
8000 FOR n=1 TO 19 STEP 2
8010 IF c(n)=x AND c(n+1)=y THEN
 GO TO 8040
8020 IF c(n)=y AND c(n+1)=x THEN
 LET z=c(n): LET c(n)=c(n+1): LE
T c(n+1)=z: GO TO 8040
8030 NEXT n: RETURN
8050 LET r=0: LET z=0: FOR q=1 T
O 20: LET r=r+(c(q)=x): LET z=z+
(c(q)=y): NEXT q
8080 IF r>z THEN LET n=n+1: GO T
O 2060
8090 IF z>=r AND z>1 THEN GO TO
2500
8100 RETURN
9000 LET r=2*(INT (RND*28))+1
9010 IF a(r)=10 THEN LET r=r+2-5
6*(r>54): GO TO 9010
9020 RETURN
9100 LET m(n)=a(r): LET m(n+1)=a
(r+1): LET a(r)=10: RETURN
9150 PRINT ; INK 7; PAPER 0;AT 1
8,8+n;m(n);AT 19,8+n;m(n+1): RET
URN
9200 LET c(n)=a(r): LET c(n+1)=a
(r+1): LET a(r)=10: RETURN
9250 PRINT AT 2,8+n;"(isP)";AT 3
,8+n;"(isP)": RETURN
9500 LET t=t-1: IF t>9 THEN PRIN
T AT 5,16;t: RETURN
9510 IF t<10 THEN PRINT AT 5,16;
" ";t: RETURN
9600 PRINT ; INK 7; PAPER 0;AT 1
1,31;a;AT 12,31;b: PRINT AT 10,3
0;"x";AT 13,30;"y": LET x=a: LET
 y=b: RETURN
9650 PRINT AT 18,7+w;" ";AT 19,7
+w;" ": LET mt=mt-1: LET h=h-2*(
h=2): LET g=g-2*(g=2): RETURN
9700 PRINT AT 2,8+n;" ";AT 3,8+n
;" ": LET ct=ct-1: LET h=h-2*(h=
2): LET g=g-2*(g=2): LET c(n)=10
: LET c(n+1)=10: RETURN
```





NORTH AMERICA MAP

A PROGRAM written by John Holden of Blackpool, Lancashire for the 16K ZX-81 will produce a map of North America when RUN. Pressing any key will produce information about population, languages spoken, and other relevant facts. Pressing any key repeatedly will run through all the information and return to the map.

```
  10 PRINT "(12*sP:93:9w:94)"
  20 PRINT "(5*sP:94:5*sP:94:99:
2*isP:9w)"
  30 PRINT "(sP:94:sP:96:99:isP:
95:3*sP:98:95:2*isP:12:isP:98)"
   40 PRINT "(sP:92:9w:isP:11:isP
:9w:sP:93:92:sP:91:sP:92:9r:isP:
95)"
  50 PRINT "(4*sP:9r:3*isP:98:95
:91:isP:96:sP:98:isP:9w)"
  60 PRINT "(5*sP:4*isP:96:isP:s
P:92:isP:sP:92:97)"
  70 PRINT "(5*sP:6*isP:93:sP:97
:94)"
```

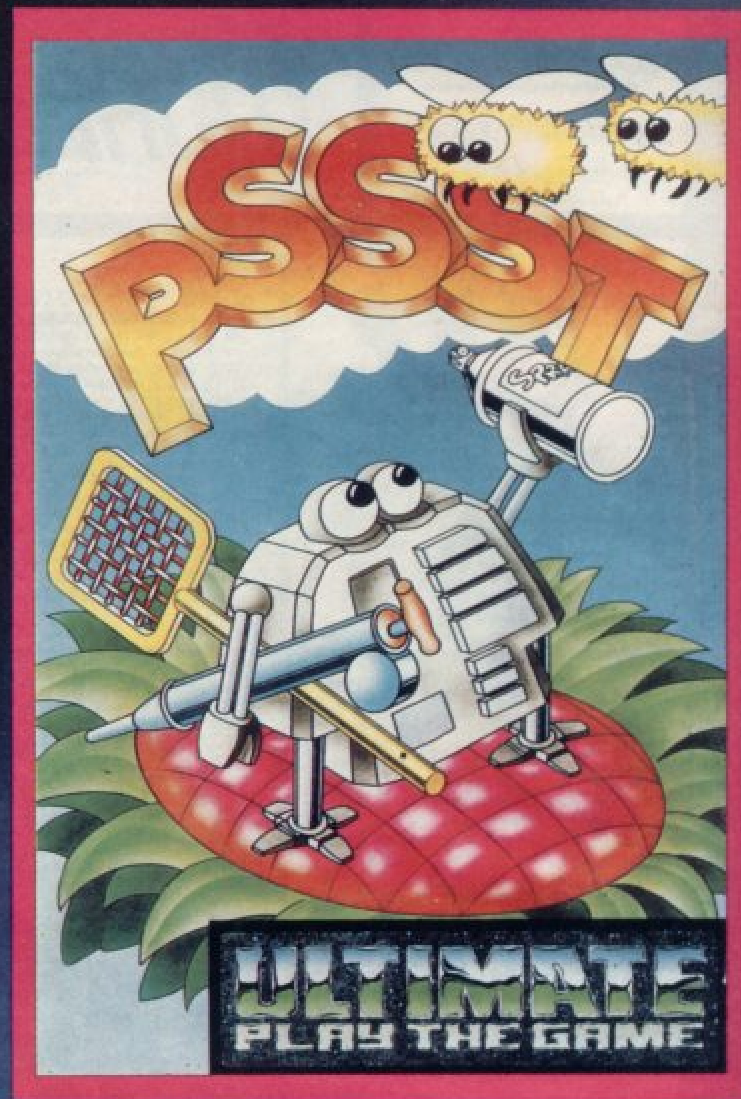
```
  80 PRINT "(5*sP:2*isP:13:2*isP
:95:sP:98:isP:96)"
  90 PRINT "(5*sP:5*isP:9w:96:sP
:3*isP:95)"
 100 PRINT "(5*sP:7*isP:96:3*isP
:92:91)"
 110 PRINT "(4*sP:99:11*isP)"
 120 PRINT "(4*sP:11*isP)"
 130 PRINT "(4*sP:5*isP:14:4*isP
:91)"
 140 PRINT "(4*sP:9r:9*isP)"
 150 PRINT "(4*sP:2*98:7*isP:9e)
"
 160 PRINT "(4*sP:2*98:3*sP:9e:2
*97:9r)"
 170 PRINT "(4*sP:92:94:3*isP:4*
sP:91)"
 180 PRINT "(7*sP:2*isP:2*sP:94:
92:16:96:93)"
 190 PRINT "(7*sP:9r:15:9w:99:95
)"
 200 PRINT "(8*sP:92:97:9r:9w:96
)"
 210 PRINT "(12*sP:9r:2*sP:99:2*
sP)"
 220 PRINT "(13*sP:2*97:3*isP)"
 230 IF INKEY$="" THEN GOTO 230
 240 CLS
 250 PRINT AT 1,12;"INDEX"
 260 PRINT AT 2,12;"-----"
 270 PRINT
 280 PRINT "1 - ALASKA"
 290 PRINT
 300 PRINT "2 - GREENLAND"
 310 PRINT
 320 PRINT "3 - CANADA"
 330 PRINT
 340 PRINT "4 - USA"
 350 PRINT
 360 PRINT "5 - MEXICO"
 370 PRINT
 380 PRINT "6 - CUBA"
 390 PRINT AT 21,5;"PRESS ANY KE
Y TO CONT"
 400 IF INKEY$="" THEN GOTO 400
 410 CLS
 420 PRINT AT 1,12;"ALASKA"
 430 PRINT AT 2,12;"------"
 440 PRINT
 450 PRINT "C.JUNEAU;       A 586,
400 SQ MI.;"
 460 PRINT
 470 PRINT "P 274,000."
 480 PRINT
 490 PRINT AT 8,12;"PRODUCTS"
 500 PRINT AT 9,12;"--------"
 510 PRINT
 520 PRINT "FISHING          FORE
ST PRODUCTS"
 530 PRINT
 540 PRINT "FURS
     MINING"
 550 PRINT
 560 PRINT "OIL."
 570 PRINT AT 21,5;"PRESS ANY KE
Y TO CONT"
 580 IF INKEY$="" THEN GOTO 580
 590 CLS
 600 PRINT AT 1,10;"GREENLAND"
 610 PRINT AT 2,10;"---------"
 620 PRINT
 630 PRINT "C GODTHAAB;    A 840,
000 SQ MI.;"
 640 PRINT
 650 PRINT "P 48,000."
 660 PRINT
 670 PRINT AT 8,12;"DENSITY"
 680 PRINT AT 9,12;"-------"
 690 PRINT
 700 PRINT "5 PEOPLE TO 100 SQ M
I.;"
 710 PRINT
 720 PRINT AT 13,12;"PRODUCTS"
 730 PRINT AT 14,12;"--------"
 740 PRINT
 750 PRINT "CRYOLITE MINED."
 760 PRINT AT 21,5;"PRESS ANY KE
Y TO CONT"
 770 IF INKEY$="" THEN GOTO 770
 780 CLS
 790 PRINT AT 1,12;"CANADA"
 800 PRINT AT 2,12;"------"
 810 PRINT
 820 PRINT "C OTTAWA;    A 3,851,
809 SQ MI.;"
 830 PRINT
 840 PRINT "P 21,477,000."
 850 PRINT
 860 PRINT AT 8,10;"LANGUAGES"
 870 PRINT AT 9,10;"---------"
 880 PRINT
 890 PRINT "ENGLISH
     FRENCH"
 900 PRINT
 910 PRINT AT 13,12;"RELIGION"
 920 PRINT AT 14,12;"--------"
 930 PRINT
 940 PRINT "PROTESTANT , ROMAN C
ATHOLICISM."
 950 PRINT AT 21,5;"PRESS ANY KE
Y TO CONT"
 960 IF INKEY$="" THEN GOTO 960
 970 CLS
 980 PRINT AT 1,12;"USA"
 990 PRINT AT 2,12;"---"
1000 PRINT
1010 PRINT "C WASHINGTON DC.A 3,
615,211 SQ M"
1020 PRINT
1030 PRINT "P 209,816,000."
1040 PRINT
1050 PRINT AT 8,10;"LANGUAGE"
1060 PRINT AT 9,10;"--------"
1070 PRINT
1080 PRINT "ENGLISH."
1090 PRINT
1100 PRINT AT 13,11;"RELIGIONS"
1110 PRINT AT 14,11;"---------"
1120 PRINT
1130 PRINT "PROTESTANT       ROMA
N CATHOLIC."
1140 PRINT
1150 PRINT "      ---------------
-------"
1160 PRINT "AMERICA HAS 50 STATE
S"
1170 PRINT AT 21,5;"PRESS ANY KE
Y TO CONT"
1180 IF INKEY$="" THEN GOTO 1180
1190 CLS
1200 PRINT AT 1,13;"MEXICO"
1210 PRINT AT 2,13;"------"
1220 PRINT
1230 PRINT "C MEXICO CITY.A 761,
602 SQ MI."
1240 PRINT
1250 PRINT "P 50,462,000."
1260 PRINT
1270 PRINT AT 8,10;"LANGUAGE"
1280 PRINT AT 9,10;"--------"
1290 PRINT
1300 PRINT "SPANISH."
1310 PRINT
1320 PRINT AT 13,12;"PRODUCTS"
1330 PRINT AT 14,12;"--------"
1340 PRINT
1350 PRINT "COFFEE
     MAIZE"
1360 PRINT
1370 PRINT "SILVER."
1380 PRINT AT 21,5;"PRESS ANY KE
Y TO CONT"
1390 IF INKEY$="" THEN GOTO 1390
1400 CLS
1410 PRINT AT 1,12;"CUBA"
1420 PRINT AT 2,12;"----"
1430 PRINT
1440 PRINT "C HAVANA;          A 44
,218 SQ MI."
1450 PRINT
1460 PRINT "P 8,579,000."
1470 PRINT
1480 PRINT AT 8,10;"LANGUAGE"
1490 PRINT AT 9,10;"--------"
1500 PRINT
1510 PRINT "SPANISH."
1520 PRINT
1530 PRINT AT 13,12;"PRODUCTS"
1540 PRINT AT 14,12;"--------"
1550 PRINT
1560 PRINT "MINERALS
     SUGAR"
1570 PRINT
1580 PRINT "TOBACCO"
1590 PRINT AT 21,5;"PRESS ANY KE
Y TO RETURN"
1600 PAUSE 4E4
1610 CLS
1620 IF INKEY$="" THEN GOTO 10
1630 CLS
```

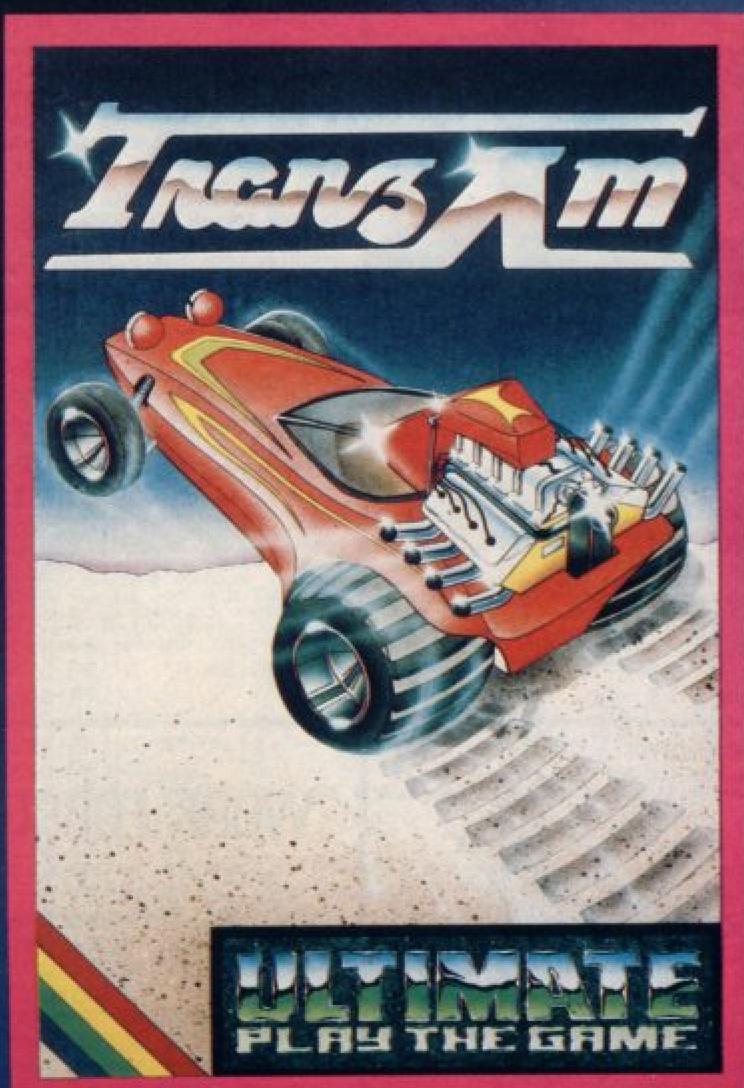


JET PAC–
16/48K ZX Spectrum or 8K Expanded VIC20

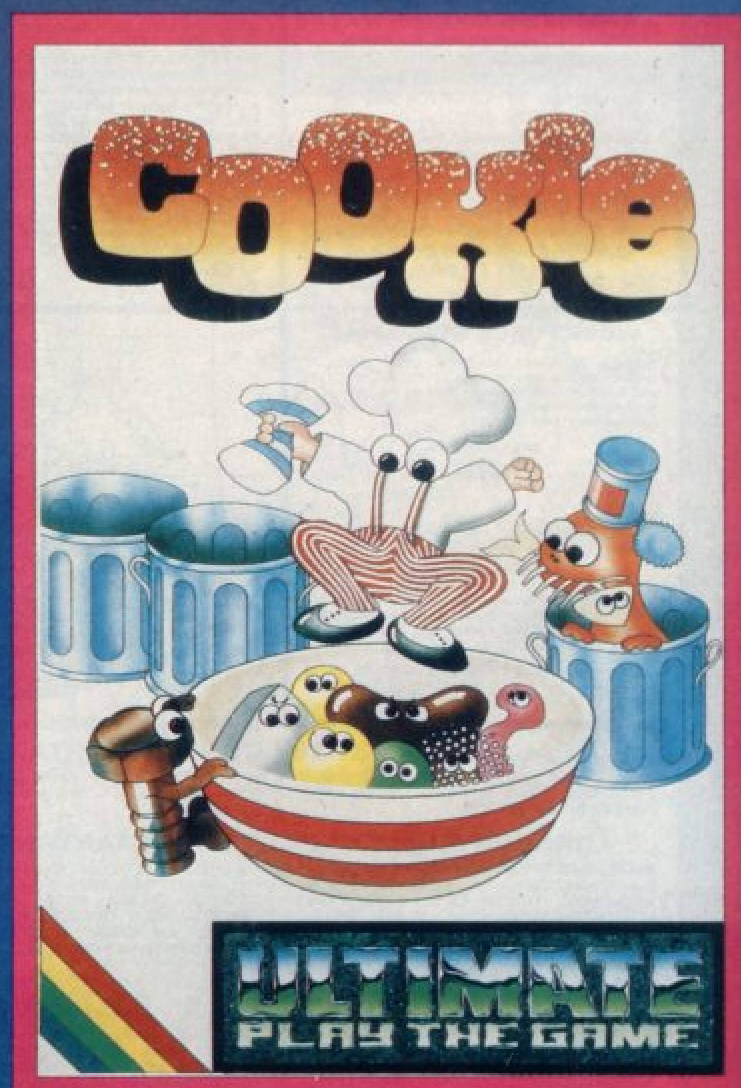


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Revenge
ORIC I
Super
Meteors
ORIC I
Acheron's
Rage
ORIC I
SOFTEK

In the third part of his series John Gilbert explains how Forth can create graphics and sound

Added commands for a more attractive language

THE GRAPHICS commands which are used in the Artic Forth and Abersoft Forth packages are not part of the original Fig-Forth standard. The commands, which allow the user to manipulate attributes, draw lines and produce user-defined graphics in Forth programs have been added to make the language more attractive to a market which, at the moment, is still engrossed in obtaining better and faster graphics effects.

Forth may not be the most suitable language in which to design space invader programs but, apart from machine code, it is the easiest and is one of the most effective. In this article the construction of graphics and routines in which they can be used is discussed but it is not intended to be an in-depth view, as the series is about Forth and not machine-specific extensions.

The most basic commands are the colour and attribute functions. In Basic,

'Try drawing a square in Forth and then computing the speed at which it is drawn in Basic'



the command to change the screen colour is:

PAPER 1:CLS

In Forth the word to change the paper colour of the screen is slightly more involved. The Forth command to change paper is like any other command in that language. We have to take the stack into account and supply it with the number of the colour we want. To change paper we can type:

1 PAPER

You will have noticed that something strange has happened. Every time you type a letter on the screen the attribute containing the current colour is set to one, or blue, and the character square you have just used turns to blue. If we want to change the whole screen to blue, we have to resort to our knowledge of Basic and type:

1 PAPER CLS

You should then have all the screen, except for the border area, covered in blue. The INK will be black but can be changed by typing the ink colour and the command:

6 INK

If you have followed this description closely you should have determined by now that you can manipulate the attribute file of the Spectrum more easily in Forth than in Basic. You should have control over either the full screen colour or a specific character block through just two commands in Forth. The same would take a PRINT AT instruction followed by a PAPER and colour number or CHR$ in Basic.

To take an example, we could change the universal paper colour to blue with:

1 PAPER CLS

The ink can be set using:

6 INK

and the local character screen colour can be re-set using:

3 PAPER

The border can also be changed using the same format:

4 BORDER

You can see that those commands are similar to Basic when writing programs in Forth and very easy to use. One useful word which we could develop with the aid of them is an extended CLS command. At the moment CLS will

clear the screen and re-set the cursor to the home position at the top left of the screen. The only difficulty is that when a program has finished, or you have changed the colour of the PAPER, that old paper colour will remain on the screen — our new word, which I will call RESET.

Type-in the word in figure one and to test it, type:

1 PAPER CLS
4 INK

That should make the screen almost unreadable. Type the new word, RESET, and the screen should clear. The alternative is:

7 PAPER 0 INK CLS

and, as you can see, there is a considerable amount of saving of time and finger work.

Attribute manipulation is the easy part of graphics using Forth. The other two parts are plotting which, in turn, leads to line drawing. The commands to do both those tasks are again very close to Basic.

The PLOT instruction will do two things — position the cursor at a specified x, y set of co-ordinates on the high-resolution screen, and fill the memory location dot on the high-resolution screen with the current ink colour.

As an example we could plot a red dot at the bottom left-hand corner of the screen. To do that type:

CLS 2 INK 0 0 PLOT

We could draw a line using the PLOT word and a loop command such as DO, which is explained in both the Abersoft and Artic Forth manuals. That routine will draw a line in about the same time as a line would be drawn in Basic, because the Forth language is faster than Basic.

It is not necessary to use PLOT to draw lines as there is a DRAW word available in the current Forth dictionary. That functions in the same way as PLOT but you have to put a PLOT command before it to state the point of origin of the line.

Unlike the DRAW command in Basic, the Forth command will not take into account any error messages if the line should go off the screen. That may sound ideal — no error message when something goes wrong — but then you must remember that the DRAW command will start to draw lines which are off the screen and when you DRAW again, nothing will appear.

Figure two is a Forth word, SQUARE, which will draw a square at the bottom left corner of the screen. It shows that the screen co-ordinates used



in the DRAW command are absolute and in that way the command is different from that in Basic.

It is a good idea, as suggested in the manual, to try drawing a square in Forth and then computing the speed at which it is drawn in Basic. You should notice a considerable difference, Forth being the faster of the two languages.

'The commands are similar to Basic when writing in Forth and very easy to use'

The other commands which can be used in Forth also relate to Basic. They are BRIGHT, INVERSE, FLASH and COVER. All have their arguments before the command and the arguments can be 0 or 1, just as they are in Basic.

Now you have a fair understanding of how graphics work, and just to accustom you to some co-ordination of Forth words, we will add some sound effects to the SQUARE drawing routine in figure two.

Music is produced using the BLEEP command, which functions just like the Basic BEEP command except that the argument, duration and pitch relate to machine code cycles and, as a result, one cycle will be performed much quicker in Forth than in Basic. For that reason the numbers used in the word definition are longer than are used with Basic.

Type-in figure two and then type figure three, which is the new musical command called MUSIC. That will produce a series of BEEPs after the square has been produced on the screen, although it will seem as if both actions have taken place together. To obtain that effect type-in:

SQUARE MUSIC

The lower the arguments of BLEEP become the higher the pitch and the lower the duration will be. The highest of either number you can reasonably expect to hear is:

90 90 BLEEP

That is extremely quiet and to gain the full effects of Forth music you should use an amplifier. Because of the quality of sound, relative to Basic, which BLEEP provides it is worth playing with that command. You should be able to do as well with it as many machine code programmers do with their games. Unfortunately Forth will not help you with composing the tunes you want to produce in your programs but it will give you the speed advantage over Basic.

Next month I will be tieing-up the odds and ends of the various aspects of Forth we have examined. I will also be beginning the intermediate level of this series where we will be investigating how Forth can be used constructively and how it is being used by other people. I will also discuss the way in which you can create Forth dictionaries.

For those who do not yet have a Forth package, I would still recommend Abersoft Forth. Abersoft has ceased to produce this package and Melbourne House, manufacturer of The Hobbit, has taken over. All further requests should therefore be addressed to Melbourne House.

Figure 2.

```
: RESET PAPER 7 CLS
  INK 0 ;
```

Figure 1.

```
: SQUARE
0 0 PLOT 0 50 DRAW
50 50 DRAW
50 0 DRAW
0 0 DRAW ;
```

Figure 3.

```
: MUSIC
400 400 BLEEP
300 300 BLEEP
200 200 BLEEP ;
```

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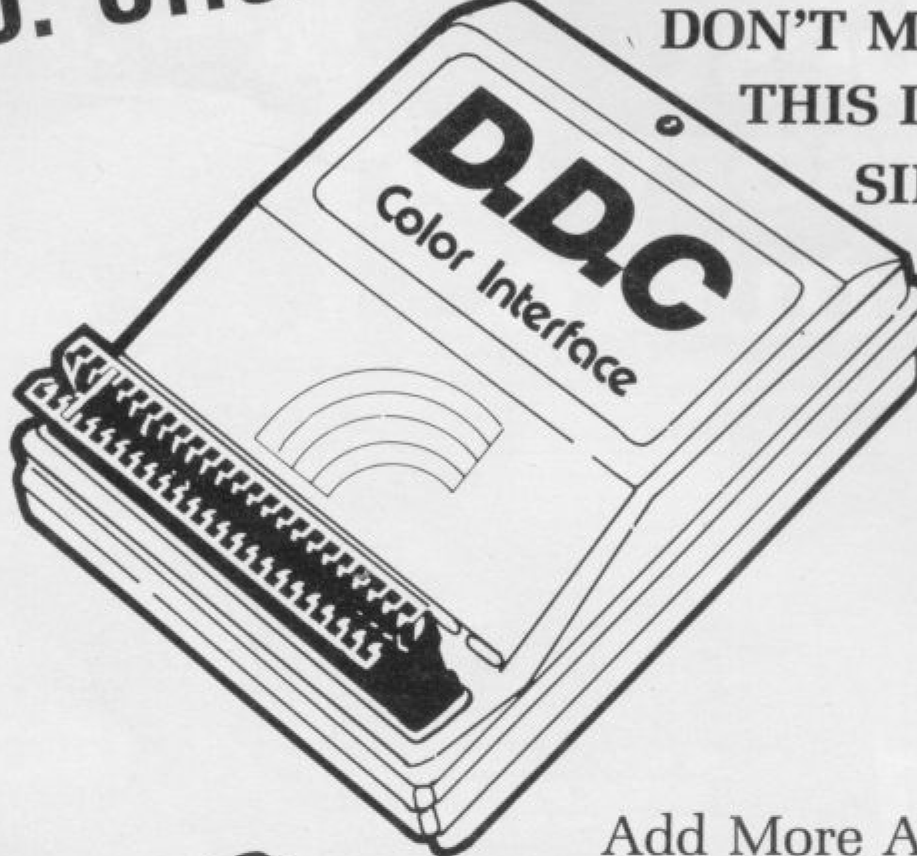
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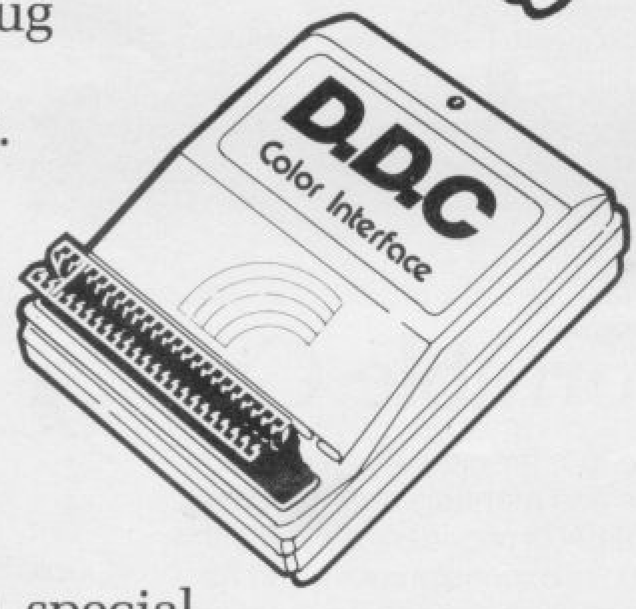
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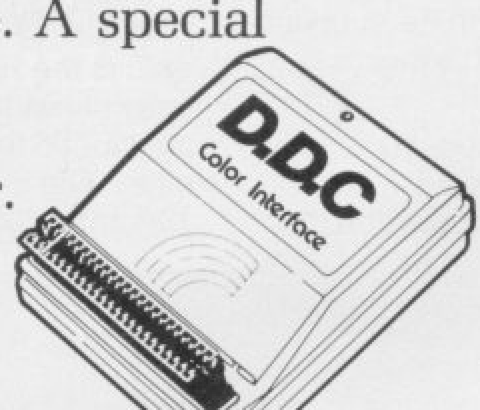


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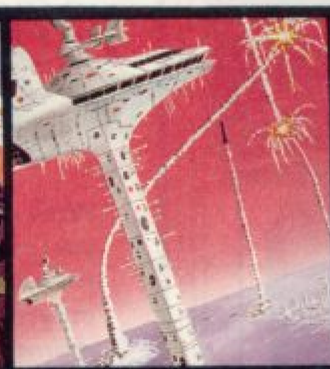
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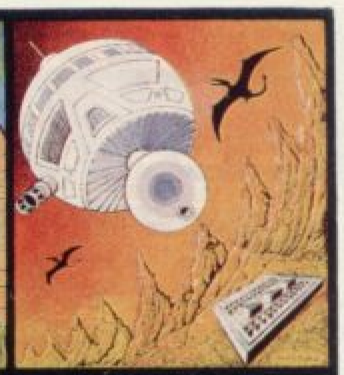
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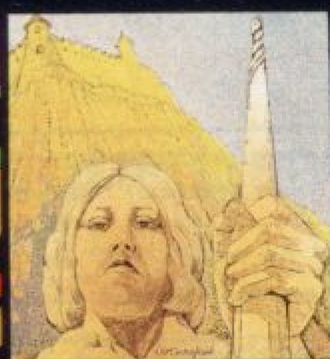
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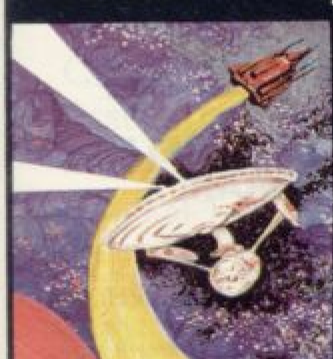
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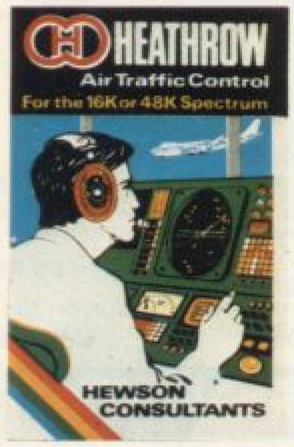
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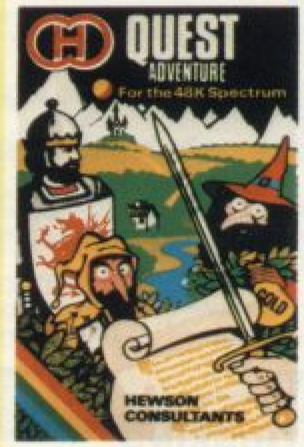
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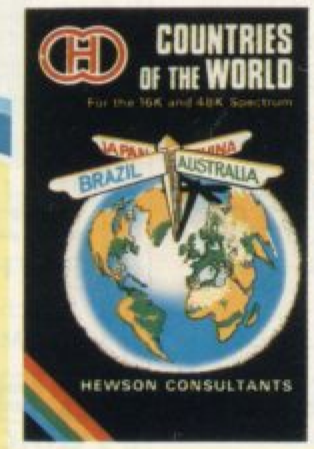
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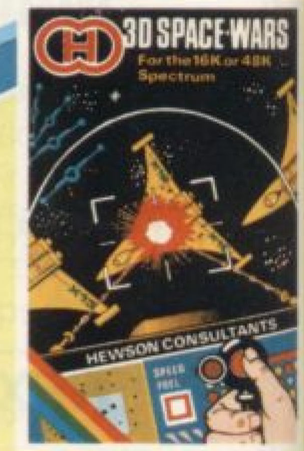
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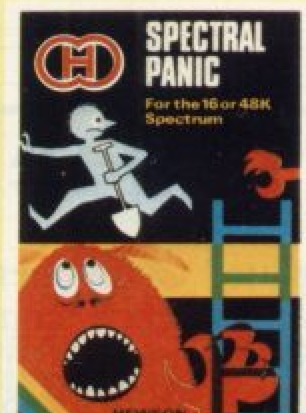
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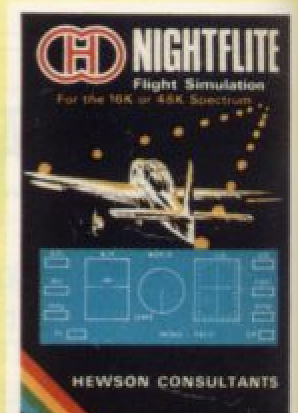
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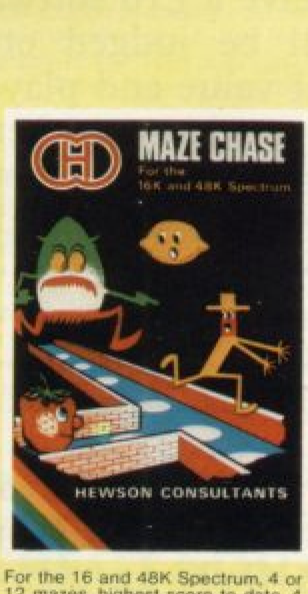
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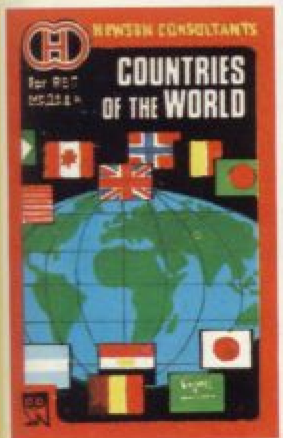




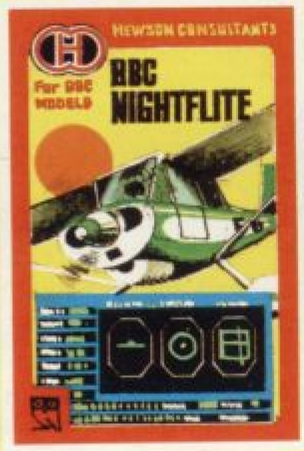
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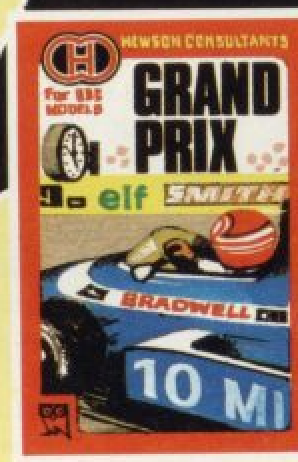
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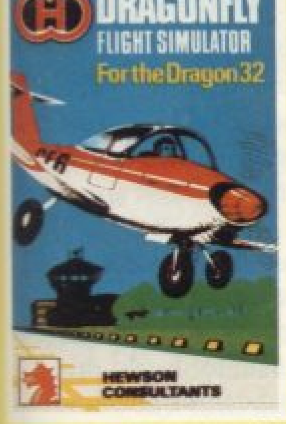
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Exploiting the potential of a family Spectrum

The Perez household is pioneering home computing in Strasbourg. Claudia Cooke reports

JOSEPH PEREZ has had his 16K Spectrum for only six months but already he has written an impressive 14 programs, ranging from simple graphics with music, to amuse his four young children, to a complicated management program aimed at playing the Stock Exchange.

What is more, he has done that with the added handicap of being a Frenchman living in France and having to write his programs in English.

When he first considered buying a home computer, Perez began ordering *Sinclair User* as he had heard that Sinclair products were inexpensive and well-suited to his needs. Having started with the intention of buying a ZX-81, he soon became hooked on the idea of a Spectrum.

"I started reading about all the colours and the graphics and I could not resist it. I wanted a computer partly so that my children could learn on one at home and the Spectrum seemed ideal for that purpose", he says.

While most of us here can just walk into a high-street shop and buy a Sinclair computer over the counter, life is not that easy in France.

Perez, who lives in Strasbourg, realised that the television system in France was not PAL, so it would not be possible to have a Spectrum after all.

Then he discovered that PAL operated in one region of France — his home region of Alsace. Not deterred by the fact that he could not buy the Spectrum in France, or that Sinclair Research was loathe to send him one from England, Perez persevered and went to Germany where he met with success. The PAL television system exists in Germany and Sinclair is apparently proving popular there.

The other reason for buying a Sinclair product was that in France there is a heavy import duty on all videos from Japan and the government was talking of extending that duty to cover all electrical goods from Japan, including computers.

Perez, who is project manager for a French bank, is no newcomer to computers. He has an MA in computer science and specialises in the subject at work, thinking and planning programs for loans and other transactions with customers.

Although at work there is a big IBM commercial computer, Perez no longer does any programming himself, having to pass his ideas to a full-time programmer.

"The Spectrum is marvellous for me because it is so different from work. Obviously I find it easy to learn, because computing is my subject, but at home I write programs on all the things about which I could never write programs at the bank.

"I do graphics for the children — things like the Smurfs — and I have several programs of music. I wrote one program for my youngest girl, who is two years old, which allows her to press



any key at random and hear a tune while watching the notes make patterns on the screen.

"My only big problem is that I never finish the programs properly. I start masses of them but for me the pleasure is in the conception of a program — the architecture. Once I have envisaged the program I am not terribly interested in writing it, so none of them is finished. It is lazy of me, I know, but that is the way I am."

Despite that minor shortfall, the Spectrum has proved an enormous success in the Perez household, where it has given the four children the status of having a home computer; no other child in their school has one, in contrast to many British homes.

Already the six-year-old son will spend hours in front of the Spectrum, once his father has entered a program and Perez hopes that his children will be writing simple programs within two years.

It is not only in his home that Perez, who is 33, has been stimulating interest in computing. At the bank where he works he has had an enormous response to a questionnaire asking other members of staff whether they would be interested in setting-up a home computing club.

With 30 people showing definite signs of interest already, Perez hopes that the club will have its own pool of computers by the New Year, probably Spectrums, and he plans regular meetings of members to swap ideas.

He says France is several years behind England in terms of computer awareness in schools but he and his 32-year-old wife Loly are moving their family to Israel next year and hope that computer studies there might be faster-moving by the time their children are of secondary school age.

Both Perez and his wife went to Strasbourg from Tunisia, where they were born and grew up. It was not until Perez arrived in France to begin his university studies that he first encountered the concept of computers and their potential.

Since then they have become not just a career, but a passion. His wife jokes: "He spends every night in front of the computer. Never mind mistresses, I am jealous of the Spectrum".

In reality she is forced to admit that home computers can be of considerable benefit to the whole family. "I am not interested in operating it. I don't really know why. I suppose I am a little frightened really. I would have to be blind not to see the pleasure it gives to our children, and my husband has also written programs which are a help to me.



"I am studying for my MA in Hebrew at university and I have to write a thesis on Tunisia before the Second World War. My husband is writing a program which will enable me to call-up selected information from newspapers of the time, or books which I have found, and I am sure it is going to make my task much quicker and more fun".

They are Jewish and another of their favourite programs is a French-Hebrew dictionary on which Perez is working. Press each letter of the alphabet on the Spectrum keyboard and the Hebrew equivalent appears on the screen. Then there are lists of everyday phrases and various figures of speech with their Hebrew counterparts ranged neatly in a neighbouring column.

There is also a dictation program for the children, with a self-correcting device taking them back to the start each time they mis-spell a word.

Perez has not yet bought programs, largely because they are difficult for him to obtain in France, but there are not many which he feels he could not write himself. He would like to buy a chess program and a light pen for improved graphics and he is interested in a program of geography studies for his children. Having studied the intitial Spectrum education tape, he feels at ease with the machine and happy to attempt almost any subject with it.

> 'My youngest child can say only two words so far — daddy and computer'

"One day I know I would like to increase my Spectrum to 48K but I have no programs yet big enough to warrant more than the 16K. It is something I will probably buy before we leave for Israel", he says.

His next project is to attend evening classes in electronics to enable him to build a control box for his Spectrum. He admits he has become addicted to the Spectrum and makes no apology for that fact.

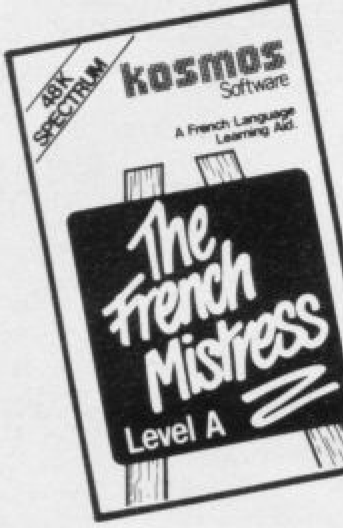
"My youngest child can say only two words so far — daddy and computer. To my mind both are terribly important words and I am very happy with her progress", he says.

The Perez family photograph album recently has become a pictorial record of parents and children grouped in varying formations around the Spectrum and it is usually the Spectrum which takes pride of place.

It has become an important member of the household. For the children, it is a novelty more than for most English children; for Loly it is becoming an aid to her studies; and for Perez it is a friend with limitless potential which he intends to exploit to the full in the next few years. It is a challenge he was ready to accept.

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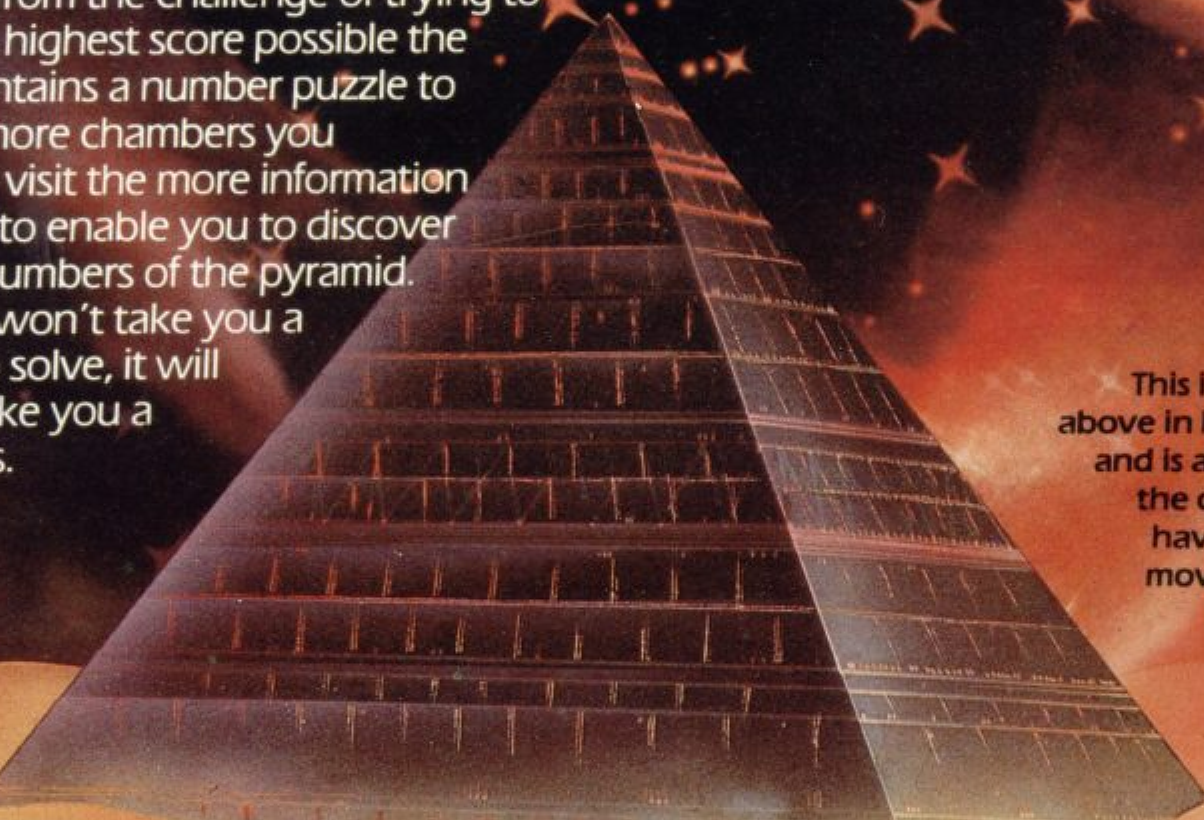
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The Pyramid is inhabited by a total of 60 wierd and exotic alien types, all of which are beautifully animated. You will meet a whole variety of demons, droids, insects and monsters, with a sprinkling of the more unusual, the extra-terrestrial tweezers, galactic strawberry, cosmic claw, mutant eye, plus a whole host of entities that defy rational description. You will no doubt invent your own nicknames.

You proceed to explore the Pyramid from top to bottom with the difficulty generally increasing with the depth of level. Depending on the choice of exit from each chamber you are likely to have a different game every time you play.

Apart from the challenge of trying to achieve the highest score possible the pyramid contains a number puzzle to solve. The more chambers you successfully visit the more information is gathered to enable you to discover the secret numbers of the pyramid. The puzzle won't take you a few days to solve, it will probably take you a few months.





This is "ZIGGY". He is shown above in his exploratory capsule and is a true representation of the on screen graphics. You have total control over his movements as you explore the many chambers of "THE PYRAMID".

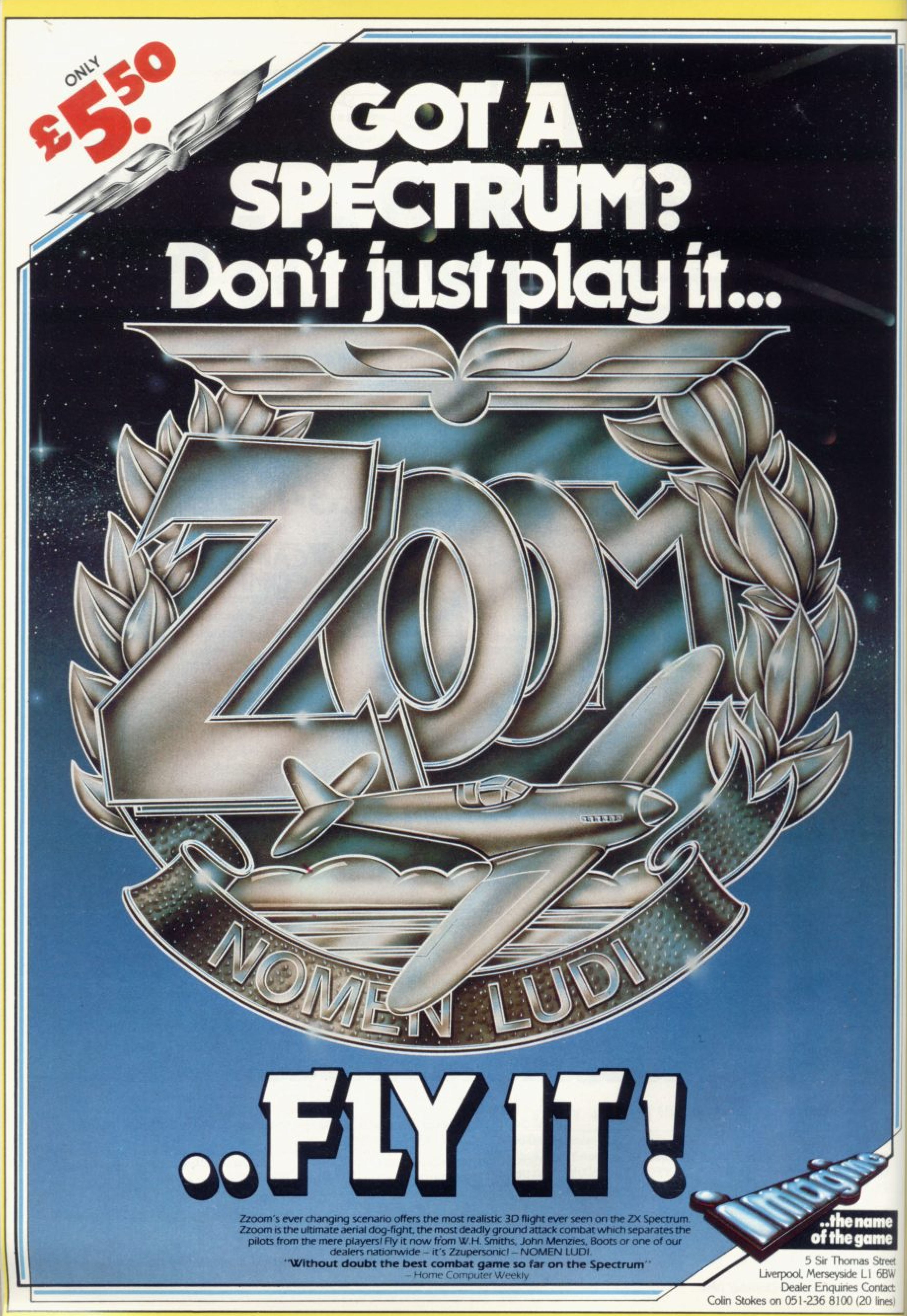
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In the first of a series on business software, Mike Wright looks at a ledger program for the Spectrum

Balancing the books with Finance Manager

WITH THE advent of the ZX-80, a previously-untapped market of people who wanted to learn about computers and new technology was uncovered. The ZX-81, with its 1K memory expandable to 16K, took the development of that market a stage further and soon more than 400,000 machines had been sold. In a short time commercially-produced software began to appear but despite the large numbers of businessmen who bought ZX-81s, games predominated. Those who wanted to use the ZX-81 seriously found that, for the most part, they had to write their own programs.

Many reasons were given for not using the 81 seriously, including the comparatively small amount of memory, the touch-sensitive keys — not suitable for large-scale entry — the quality of the printout from the ZX printer with its narrow 32-character line, and the occasional unreliability of the machine when connected to the 16K RAM pack.

Those who suffered that fate know how aggravating it is. Independent suppliers did their best to change the situation with interfaces for full-travel keyboards, printers and even discs, while others produced stabilisers to reduce crashes.

The Spectrum went a long way towards meeting those objections, with its more positive rubber keys, but still not a full keyboard, the built-in 16K or 48K memory and a more solid design. The promise of an RS232 port, released recently as part of Interface One, an industry-wide standard connection to quality printers, also helped.

Even with those improvements business software received only minor attention from Spectrum programmers. Apart from a few companies, such as Hilderbay and Hilton Computer Services, new programs and companies were aimed solidly at the games market. The few business programs which existed were written by businessmen with the computer bug. Such programs often did the job but paid little attention to presentation, clarity of output, usability and documentation.

Fortunately the position has been improving slowly and now available are a wide range of spreadsheet, word processing, accounts and ledger programs. Other packages include programs for calculating payrolls, working-out Statutory Sick Pay, controlling stock and mailing lists. So far there seem to be very few programs available for planning, engineering and statistical applications, although with the Microdrive paving the way for the storage and manipulation of even larger sets of data, the gap may soon be filled.

One further point which should encourage the development of business software is the news that Spectrum programs should be upwards-compatible with the new Sinclair Research personal computer aimed at the lower end of the business market and rumoured for release in early 1984.

> 'The program is in machine code, making the response time almost instantaneous'

We look in the first of a series on business software at Finance Manager from one of the leading names in business software, OCP.

Finance Manager is designed as a ledger program which will record transactions and keep running totals of all accounts, but will also allow some measure of forward planning to be made. It is claimed that the program is useful for almost all domestic and business applications, such as domestic and business accounts, specific and general ledgers, financial budgeting and planning.

The program is written in machine code for the Spectrum, which makes the response time almost instantaneous. It will cope with up to 255 separate accounts and standing orders, more than 1,800 individual transactions — on the 48K machine — and operates a double entry automatically. The price is £8.95, making it a very attractive program.

Finance Manager is packaged in the increasingly-popular book-type cardboard box. Inside is a moulded plastic insert to hold two cassettes, one for the program, the other for a data storage cassette which is not included. That is a pity when one considers that the extra cost would be minimal. The box also contains the 24-page manual. The copy supplied for review was the standard 32-column version, although OCP also offers a Plus 80 version which can print 40 characters per line on a printer with a Centronics interface.

It can also supply the interface to the Spectrum. The cassette holds the 48K version and a test file — designed as a training aid to complement the manual — on one side and a 16K version and test file on the other.

Before starting it is worthwhile reading the manual and becoming fully-acquainted with the editing features and commands, including the two operating modes. In the normal mode the keyboard operates normally. In mode A, which is reached at any time by pressing SYMBOL SHIFT and A, the cursors are accessed by presssing the cursor keys, while to use the numbers, CAPS SHIFT and the number must be pressed.

Although it may seem unnecessarily complicated to have the two modes, it is a very useful feature, especially when amendments are being made. Movement around the screen from field to field is done using the cursor keys; ↑ and ↓ move the flashing cursor, used to indicate the field in use, backwards and forwards respectively between fields, while ← and → move the cursor within fields. Editing in a field can be done using SYMBOL SHIFT and either E, I or D to erase a field, or to insert or delete within the field. Other editing features include the scrolling of ac-

continued on page 140

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continued from page 135
count/description names using SYMBOL SHIFT with W for forward scrolling and with Q for backward scrolling. The scrolling can be speeded by typing-in the first few letters of the name and scrolling forward, which selects the first account/description starting with them instantly; the setting of markers to define a block of transactions for deleting or printing; printing the screen using SYMBOL SHIFT and G; and the merging of accounts by renaming them. Loading the program is done by LOAD "" ENTER and starting the tape. It takes slightly more than two minutes to load before the first screen appears. That sets up the options for the run by asking for the date, input as dd/mm/yy and asking LOAD FILE? (Y); APPLY S/O's?(Y) and FILENAME.

If the answers to both questions are positive, any standing orders set in the data file will be applied automatically when the data file is loaded. Once the data has been loaded or the answer to LOAD FILE? is N the main menu is displayed. That offers the options:

1. PROCESS TRANS. < >
2. PROCESS S/O's < >
3. ANALYSE EXPD. < >
4. RENAME/MARK ACC. < >
5. RENAME/MARK DES. < >
6. CHANGE DATE < >
7. MAINTAIN FILE < >

One of them can be selected by pressing any key except CAPS SHIFT, SYMBOL SHIFT or ENTER, to move the cursor round the options until it is opposite the choice and then pressing ENTER.

Selecting option one instantly brings up the process transaction menu, which offers:

1. LIST/AMEND/DEL. < >
2. ADD NEW TRANS. < >
3. LIST BALANCES < >
4. MENU < >

ACCOUNT

with the cursor at the start of the account field. An account name must be entered before using options one or two. Option three lists the balances for all accounts and a cumulative total; it is important to realise that the final total for all balances will be zero because of the automatic double-entry feature which, when an account is debited, sets up the second account line if it does not already exist and credits it. Option four returns directly to the main menu.

On selecting two, the user is asked to enter the amount. A useful feature uses the SPACE to separate the pound and the pence, whether the account is to be debited (−) or credited (+), the name of the second account, described by WHO TO/FROM and a description, if wanted.

The description field is used later for the analysis of expenditure from accounts, e.g., for the domestic user possible descriptions could include food, clothes, petrol. The date of the transaction has also to be entered and, once again, the kind of useful feature which typifies the package has been built in.

That allows the current date to be set for the transaction by pressing ENTER. Finally, the user is given the choice of adding the transaction, if all the details are correct, or of returning to the process transaction menu.

Selecting the LIST/AMEND/DEL. option asks initially for which transactions in the account are to be listed. The first stage is to set the starting-point for the listing; the default is S which lists all transactions in the account from the start. Other options are E to list the last page of transactions; T, transactions from the current date; or D, transactions from a specified date which must then be entered. Also given are choices to list Reconciled or Unreconciled transactions and New — those made during the current run — or Old transactions.

Pressing ENTER at the CONTINUE option lists the transactions selected; they can then be amended or deleted. That is done by locating the cursor against the required entry and pressing A or D as appropriate. A displays the details of the transaction to be amended which are changed by positioning the cursor to the appropriate field and typing-in the amendment.

'Another feature of Finance Manager is its ability to analyse expenditure'

Once that has been done the corrected version can be added either as a new entry or over-written on the old entry. The delete option, selected by pressing D with the cursor opposite the entry, flashes the question DELETE? (Y/N) at the bottom of the screen. To delete the transaction both Y and ENTER must be pressed.

To process or set up standing orders, option two on the main menu is selected. The subsidiary menu then offers:

1. LIST/AMEND/DEL. < >
2. ADD NEW S/O < >



3. APPLY S/O's < >
4. REMOVE S/O < >
5. MENU < >

That option can be used for all regular payments, whether they are processed automatically, processed by a bank or whether paid by cheque or cash. To add a standing order the process is almost identical to adding a transaction. The difference is when the date is to be entered. If the payment is to be made on a set day each month, only the day field is completed. Caution must be exercised. If the day does not exist in a month — e.g., February 30 — the standing order will not be applied for that month.

The author has provided for standing orders to be paid on the last day of all months by using code 32 for the day field. That will give the correct last date for each month, including February in a leap year. If the standing orders are at less frequent intervals or even irregular, that can be coped with by entering each payment as a separate standing order, leaving the year field blank if it is a regular payment each year or by completing it for a one-off future payment. The LIST/AMEND/DEL. option works in exactly the same way as for the process transaction menu.

To apply standing orders, select option three. That causes the program to ask for two dates. First is the date from which the order is to be applied. Once again a certain amount of caution must be exercised. If orders were applied from 01/01/83 to 01/03/83 in the last run and in the current run they are applied from 01/02/83 to 01/10/83, then the orders for February and March will be paid twice. Standing orders can be removed by following the same procedure in option four.

Forward planning can be carried-out using a DUMMY option with the



standing orders. That allows orders to be set up as dummies and then applied and removed independently of the other standing orders.

Another feature of Finance Manager is its ability to analyse expenditure by the transaction description via the ANALYSE EXPD option on the main menu. The subsidiary menu allows the dates to be specified between which the analysis is to take place. It is worth pointing out that in this instance expenditure means turnover, since the totals are calculated ignoring debits and credits.

The totals consequently are displayed without a sign. An option to print-out the totals is included, although the whole screen can be printed at any time using SYMBOL SHIFT G.

The amount of data handled obviously will keep increasing until a stage is reached where the Spectrum runs out of memory; the greater the number of accounts and descriptions the sooner that point will be reached and, unless a separate file is to be created, space must be made available.

One of the easiest ways of doing it, apart from deleting whole blocks of transactions, is by merging accounts or descriptions using option four (RENAME/MARK ACC.) or five (RENAME/MARK DES.) from the main menu. Those options allow accounts and descriptions to be given new names and/or allow them to be marked as a priority. Re-naming accounts is done easily by typing-in the name of the account to be re-named in the OLD NAME field and the new account name in the NEW NAME field and responding to the EXECUTE prompt.

If the new name is already assigned to an account, the two accounts will be merged and some extra space in memory will be created.

Usually some accounts are more important than others. These options allow for it by allowing such accounts to be marked with an M. The LIST BALANCES option in the process transaction menu gives the choice of printing only the balances of the marked accounts or of all accounts. The same principles also apply to re-naming and marking descriptions.

The final two main menu options allow the data set at the start of the run to be changed — option six — and general maintenance, i.e., saving and verifying the data, clearing the file, and loading a new file, to be carried-out. The CLEAR FILE option allows all entries between specified dates to be erased but at the same time will allow the full balances to be retained, if desired.

That will allow a continuation file to be set up should you run out of space and do not wish to erase any transaction or to merge accounts. Clearing the balances, however, does not clear the account names even though no balances or transactions exist.

Finance Manager impresses because of the professional appearance of the package, a smart blue box with the program tape inside it and a spare recess for a data tape, and a manual, printed professionally on quality paper. OCP professionalism does not end there. The program loaded first time over a wide range of volume and tone settings. Once loaded, the menus and screens are presented in such a way as to be clear and concise. That makes data entry easy.

The manual takes the new user step by step through each stage, from starting a new file and adding new transactions through to using standing orders for financial planning, in easy-to-understand terms. At each stage the learning process is helped by the use of examples. In general, the printing is easy to read but the diagrams of different screens are small and difficult to read. Once some expertise has been gained the user will still find the manual a useful reference.

'The user will still find the manual a useful reference'

A standard method of testing any program is to try entering options which are not offered or allowed or which do not make sense. A well-planned and written program will reject any such entry, without crashing, and will often give a warning showing exactly what is illegal.

Finance Manager passes that test with flying colours. There seem to be only two ways of escaping from the program. The first is by following the instructions and pressing all four corner keys simultaneously — i.e. CAPS SHIFT, 1,0, and BREAK/SPACE. The other is to disconnect the power supply.

Attempts to enter alphanumeric characters in numeric fields, a method which usually stops a program with an error message from the system, led to the cursor being returned to the field with a warning. Almost all unacceptable date entries are picked up and rejected, although any two-digit number is accepted as a valid month — a strange lapse considering the quality of the rest of the program.

Because it is menu-driven and the method of input is well-laid-out the package is easy enough for anyone with a minimal knowledge of computers to use. A word of warning, though; some thought should be given beforehand as to how the system of accounts and descriptions can be best used by the individual user.

The home user who uses it to check bank and building society accounts by entering each cheque or withdrawal as a transaction will soon find that the possible 255 accounts will soon be used as a separate account is set up for each shop or garage. It is better to use a generic term such as garage for transactions involving different garages.

The business user who wishes to keep sales and purchase ledgers with details of VAT will need to think about how to keep the VAT, as the program has no facility for coping with VAT separately on each transaction.

VAT could always be recorded as a different transaction but a more specific program would probably be a better choice. Although it is not yet available OCP is understood to be producing a VAT Manager. If it has the same high standard as Finance Manager it will be well worth considering.

One small point OCP might consider is the development of the system of marking accounts to allow a greater range of priority accounts to be listed together, i.e., possibly by allowing accounts to be marked with M1–M9.

In view of its overall presentation, usability and cost — less than some games — it earns the vote as the best-value financial program available for the Spectrum.

Communications from one computer to another

Stephen Adams examines how Sinclair machines can access information via a telephone line

THE INCREASE in the number of databases — libraries on computer — has led many people to look at using their microcomputers to access them via a telephone line. The number of users of microcomputers has increased rapidly in the last few years, so talking between home computers is now possible with friends anywhere in the world.

The first place to start must be the method of communicating data over a telephone line. That must be done in a serial form — one data bit sent at a time as an on/off signal — as there is only one pair of wires to carry the data signal. A device is required to turn the normally parallel data form stored in the computer into a serial stream of bits. That is done using a device which conforms to the specification laid down by the Institute of Electrical and Electronic Engineers, known as RS232C.

The parallel data byte is stored as eight data bits on eight wires in some kind of memory within the computer, each byte of data representing a number between 0 and 255 decimal. The RS232 device is usually one chip which is attached to the computer at the back via the expansion port. It takes in eight data bits at one time from the computer and adds some bits of its own to make up the data to be sent.

The RS232 device acts rather like a machine-gun. The first bullet to be loaded into the gun is called the start bit and is always binary 0. Then follow the eight data bullets starting with the lowest one — data line 0 — followed by at least one stop bullet — binary 1. Sometimes another bullet is used to check the data sent, called a parity bullet. It is added to the data between the last data bullet — data bit 7 — and the stop bullet. The number of bullets and what they do should be altered to suit the device to which you are sending. That is most important or the data will be misread — corrupted — when it is received.

The machine-gun is fired regularly at a set speed called the baud rate. When it is empty it goes back to the computer, indicating that it has finished and would like some more data bullets. The pair of wires connecting the two devices acts like a metal tube. The bullets are stored in the same way they are received, the start bullet telling the receiving device to open the tube to contain the data and the stop bullet telling it to close the tube as the data is finished.

The parity bullet, if used, is removed by the device for checking to see if the data is the same as what is sent and giving an indication if it was faulty. The device can also tell the computer if there were various other errors, such as bad timing. The start and stop bullets are, of course, removed before offering the re-assembled data byte to the computer. That, in its simplest form, is what a RS232 device does and when using one of them remember to check:

> 'Handshaking signals can be used for input or output from the computer'

Baud rate. It can usually be set to a speed between 75 and 9,600.

Number of data bits. Can be set to 7 or 8 — the Spectrum RS232 uses eight.

Parity bit to be used? Can be set to odd, even or no parity. The Spectrum RS232 uses no parity.

Number of stop bits. Usually the option of 1, 1.5 or 2. The Spectrum sends only one.

Some systems allow you to set different baud rates for transmitted and received data. The Spectrum RS232 does not. It is necessary in the case of some two-way working modems, such as Prestel, where 75 baud is used to transmit to the computer and 1,200 baud to receive data on the Spectrum.

The RS232 specification also specifies some handshaking signals which are used to inform both devices what is happening. That is where the confusion usually arises, as manufacturers have used them in different ways. To keep things simple when using a modem we will describe only one, the DTR — Data Terminal Ready — which is used to tell the Spectrum or ZX-81 that it is receiving a tone from the other computer — or data. It tells the computer that it is safe to send and receive data. It is one of the signals which appears on the RS232 for the Spectrum made by Sinclair. The modem, however, refers to this signal as CARRIER DETECT. One extra wire should thus be used to connect DTR to carrier detect.

Both of those signals expect a binary 1 when a tone is on the line. If you see a bar over any connection on an RS232, it means that it works the opposite way and works only when a binary 0 is used — i.e., $\overline{\text{DTR}}$.

Handshaking signals can be used for input or output from the computer and there are 22 from which to choose. Where they are specified as essential they should be connected either to the computer or, depending on their use, connected to a binary 1 or binary 0 voltage.

Signals on a full RS232 specification should indicate a binary 1 by a voltage of between 3-12 volts positive and a binary 0 by a negative voltage of the same value. Some RS232 devices advertised cannot produce a negative voltage and so work only with TTL levels; they should not be connected to a full RS232 specification device, as the negative voltage from the device could damage the chip. Also the device would not operate properly.

As the RS232 on its own is capable only of talking to another RS232 device, like a printer of another computer to which it is connected directly, we need a modem to allow us to use a telephone line.

The word modem is made up of two words — modulator and demodulator. It is a device which allows us to change the on/off voltages received from the RS232 into tones which can be sent like normal speech down a telephone line. That is called modulating. The opposite process at the other end which turns the

Continued on page 148

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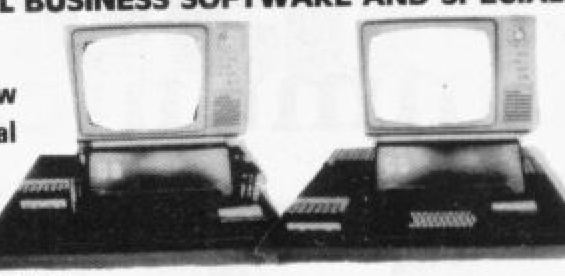
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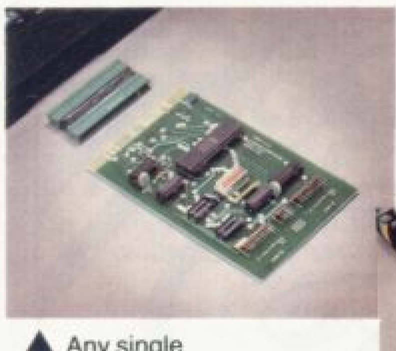
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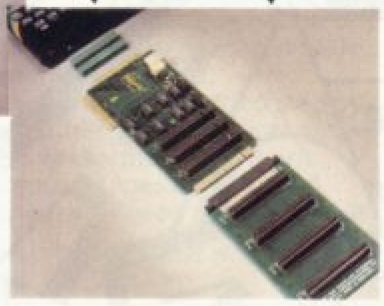
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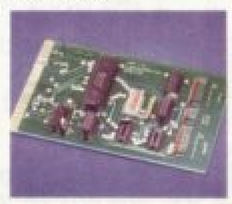
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Continued from page 143

tones back into on/off voltages for the RS232 is called demodulating.

The first modulators used a mechanical device to send voltages to operate another mechanical device at the other end. You may have seen them in Western films. They were called the telegraph and used a code invented by Samuel Morse in 1842.

These days we use a different code called ASCII — American Standard Code for Information Interchange — which is recognised by most computers as the way to send figures, numbers, symbols and special characters for controlling or informing the computer what we want to do.

Using the code it is possible for any computer to talk to any other computer, no matter who made it. The method of sending the data has also changed slightly. Two tones are used to indicate whether a binary 1 is being sent or a binary 0. If no data is being sent, a constant binary 1 is sent. See the diagram for details. The switch shown, of course, is operated from the computer via the RS232.

The receiver is made up of one or more filters and an amplifier, the output of which controls a switch which changes from +12 to −12 volts and back again. Because a binary 1 is sent when no data is transmitted, it should "rest" on the +12 volt side.

Different-speed modems use different frequencies of tone to transmit and receive. The most common — 300 baud — sends with two tones of 980Hz — binary 1 — and 1,180Hz — binary 0. In the other direction two different frequencies are used — 1,650Hz and 1,850Hz. That enables it to transmit data both ways without becoming confused.

If the same frequency were used — one from its own modem and one from the distant end — it would be unable to tell the difference. The sending modem is called the originating modem and the receiving modem called the answer modem. Some modems will work only as originate-only modems and so cannot be used with another originate modem.

Modems can be connected to the telephone line in two ways, direct connection and via an acoustic coupler. The direct-connect modem has to have special safety features built into it, such as an isolation transformer and some means of isolating the computer voltages from the telephone line. British Telecom must also install a jack socket to allow you to plug-in the modem.

The acoustic modem is connected by plugging the handset into rubber or foam cups which pick up the sound from the telephone. They are not so good as direct-connect modems, as they are affected by noise in the same room. Both types of modem must by law be British Telecom-approved to be connected to a telephone line. The manufacturer is responsible for doing that, unless it is a kit, in which case it is the responsibility of the kit builders. Modem kits are available from:

Maplins Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex. Tel: 0702 552911 — 300 baud orginate and answer modes.

Ambit International, 200 North Service Road, Brentwood, Essex CM14 4SG. Tel: 0277 230909 — 300 baud originate only.

Modems are obtainable from:

British Telecom. See your telephone directory — rental and sales of any modem type and speed.

Display Electronics, 32 Biggin Way, Croydon, Surrey. Tel: 01-679 1927. Ex-BT modems.

Micronet 800, Scriptor Court, 155 Farringdon Road, London EC1R 3AD. Tel: 01-278 3143. Prestel-compatible modem for Spectrum, inc. RS232 and terminal program.

A program is required to use a modem as, unless instructed, the computer will ignore the RS232 interface. Also it needs to give priority to incoming signals. They are usually printed on the screen. The keyboard must also be scanned and the program would usually send nothing until the NEWLINE or ENTER key had been pressed.

Normally that would be in machine code but Sinclair has provided for Basic to be used on the Spectrum. ZX-81 users would also have to translate the code to and from Sinclair codes to ASCII. The Spectrum uses ASCII anyway.

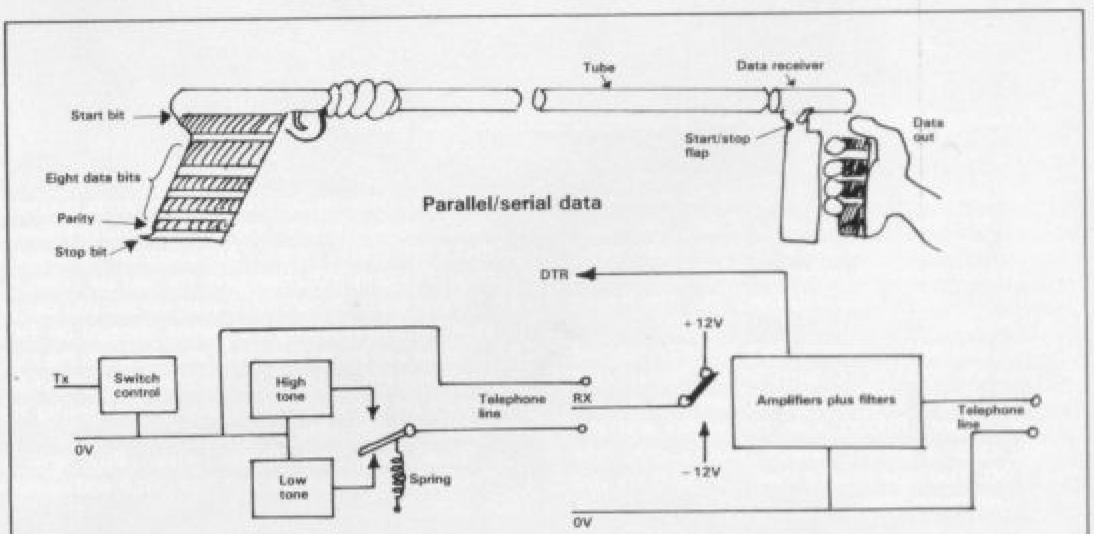
To use a database you would have to do something like this:

LOAD the terminal program after connecting the RS232 and the modem; telephone the computer; when you hear a tone — i.e., when the computer has answered the call — put the handset into the modem or switch the modem to the telephone line; if the modem is connected directly to the telephone line, replace the handset on the telephone or all the background noise will corrupt the data; watch the information page sent by the computer.

Usually it contains instructions on how to use the computer and if it requires a password, enter password if necessary; enter something — most computer lines will drop out the call if the password is incorrect, or they receive no response from a user after a certain time; on completion of the call, restore the handset to normal — if an acoustic modem is used — or restore the LINE switch on a direct connect type.

Many free databases are available where you have to pay only the telephone bill. A list can be obtained from the Amateur Computer Club or the Association of Free Public Access Systems. Most of them work on 300 baud and contain information and tips on various computers. Bulletin boards are a means of storing messages for the system users or the public — much like the cards in a sweetshop window. Some can talk to other users of the database.

'Modems can be connected to the telephone line in two ways, direct connection and via an acoustic coupler'



Private or closed databases are available to which you can subscribe. They not only provide information on scientific and medical subjects but will also allow you to do your accounts on them, rent storage space on the computer, or do large calculations. They are usually rented by the second, plus a subscription, and you are allocated a password to use them. Free databases include:

AFPAS, c/o Fred Brown, 421 Endyke Lane, Hull HU6 8HE — please send SAE.

ACC, Robert Steele, 17 Lawrie Park Crescent, London SE26 6HH. Tel: 01-778-6824. Bulletin board on 0908-44262.

Maptel, 0702-552941. Components ordering and bulletin board.

Rewtel, 0277-232628. Eight-minute maximum public bulletin board. Component ordering.

Distel, 01-679-1888. Components ordering and catalogue — includes ex-BT modems.

All the foregoing use 300 baud.

Private databases restricted to paying customers:

Prestel. Freephone 2043 for details. 1,200/75 baud working. Colour viewdata terminal required.

Micronet 800 works on Prestel, games progams, information on various computers including the Spectrum. Programs can be downloaded. Also access to Prestel.

Gateway. An international link to other databases via Prestel.

Telecom Gold, 300 baud. Message storage and access. Run by British Telecom. International links also available. Databases on the system would have to be approached individually.

Cobra Technology, 378 Caledonian Road, London N1 1DY. Database run on Telecom Gold.

> 'More and more information is going on to computers as a cheap and quick way to store files'



At present, more and more information is going on to computers as a cheap and quick way to store files. There is already more information on computers than a man could read in his lifetime, even if he spent 24 hours a day reading it.

The public is recognising and gaining access to computers. To use a database becomes the next step, whether it be a name and address file on a home computer, a device for booking next year's holiday, or even checking your bank balance.

The speed of access to a database can be increased by writing a small computer program which states your preference and places to search. That reduces the time required on the telephone to seconds.

One of the advantages of databases is that the present information can also be updated at the same speed, as most of the re-arranging of the pages can be done by computer.

The more information you can obtain, the better your decisions can be about what you will do. The major disadvantage is that the initial cost of modems is expensive and so is signing with a database.

The French government bought an automatic telephone directory system, like a computer terminal which would be given to every telephone subscriber, but the cost of installing it was too great.

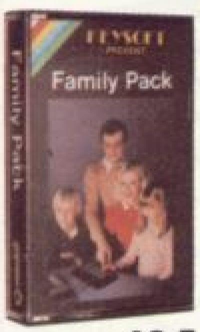
Cablevision systems should make it cheaper, as that expands the amount of information which can be sent both ways from an ordinary home. Gas, electricity and water companies are already looking at the possibilities of reading meters by computer line.

Working from home via a computer terminal to an office is just around the corner, as is schooling done in the same way. The frightening possibilities are receding as we near 1984.



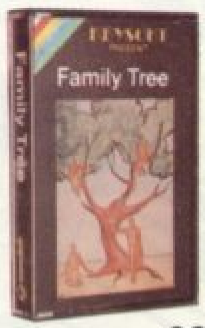
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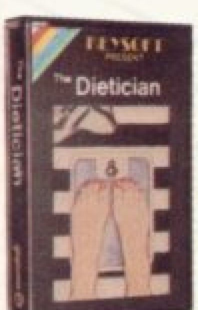
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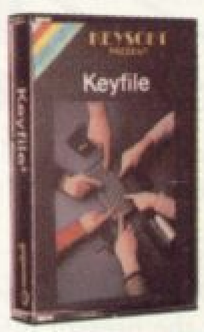
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Following an article in our August issue, Nick Goldman explains a simple machine code routine

Foolproof merging on your ZX-81

THIS VERSION of my merger routine requires both programs to be recorded previously on tape. The maximum length of each program is 8K and the routine requires the user to have 16K of memory. All the line numbers of program one must be greater than those of program two. The Merger routine is also held on tape. The first stage is to create the Merger tape. Type:

```
POKE 16388,22 (N/L)
POKE 16389,96 (N/L)
NEW           (N/L)
```

and then type-in the hexadecimal loader program in figure one. Run the program and enter the data given in figure two. That data can be entered as many items at a time as desired, so long as an even number of characters is entered before Newline is pressed. Once that is done, delete lines 10 to 80 and add the lines:

```
10 RAND USR 16514
20 NEW
```

and save the program on to tape twice. That is your Merger program. To use the Merger, type:

```
POKE 16388,22        (N/L)
POKE 16389,96        (N/L)
NEW                  (N/L)
LOAD "MERGER"        (N/L)
```

to load your already-prepared program and

```
RUN                  (N/L)
```

to initiate the routine.

Next, load program one from tape and add the line XXXX REM END, where XXXX is a line number just big enough to make it the last line of program one then type:

```
RAND USR 32684(N/L)
NEW            (N/L)
```

Then load program two into the ZX-81 and type:

```
POKE 16507,PEEK 16396 (N/L)
POKE 16508,PEEK 16397 (N/L)
```

To complete the process, add REM lines to the end of the program, each containing 100 Xs. There should be 10 such lines for each 1K of program one and they should be numbered consecutively, so that the last one is line 9999. If you decide that two such lines are required, add:

```
9998 REM XXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXX
XXXXXXX
```

9999 REM — 100 Xs, as line 9998.

Finally, type:

```
RAND USR 32710 (N/L)
```

and tidy the resulting merged program by deleting any extra REM lines remaining at the end of the process.

Figure 1. Hexadecimal loader.

```
 1 REM  XXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXX
10 LET X$=" "
20 FOR I=16514 TO 16609
30 IF X$=" " THEN INPUT X$
40 POKE I,16*CODE X$+CODE X$(2)-476
50 SCROLL
60 PRINT I; " ";X$( TO 2)
70 LET X$=X$(3 TO )
80 NEXT I
```

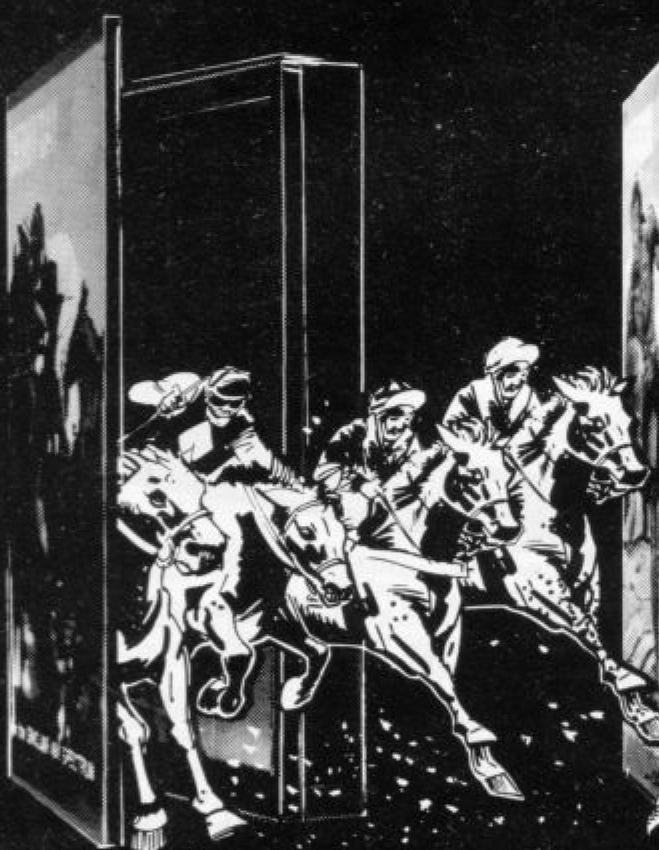
Figure 2. Hexadecimal dump of machine code.

```
01 54 00      LD BC, 84
11 FF 7F      LD DE, 32767
21 E1 40      LD HL, 16609
ED B8         LDDR
C9            RET

2A 0C 40      LD HL, (16396)
01 7D 40      LD BC, 16509
A7            AND A
ED 42         SBC HL, BC
E5            PUSH HL
C1            POP BC
11 AB 7F      LD DE, 32683
2A 0C 40      LD HL, (16396)
2B            DEC HL
ED B8         LDDR
13            INC DE
ED 53 04 40   LD (16388), DE
C9            RET

ED 5B 7B 40   LD DE, (16507)
21 AB 7F      LD HL, 32683
ED 4B 04 40   LD BC, (16388)
A7            AND A
ED 42         SBC HL, BC
E5            PUSH HL
C1            POP BC
2A 04 40      LD HL, (16388)
ED 80         LD IR
D5            PUSH DE
C1            POP BC
0B            DEC BC
03            INC BC
0A            LD A, (BC)
FE 76         CP 118
20 FA         JR NZ, -6
C5            PUSH BC
01 06 00      LD BC, 6
D5            PUSH DE
E1            POP HL
A7            AND A
ED 42         SBC HL, BC
C1            POP BC
E5            PUSH HL
6E            LD L, (HL)
26 00         LD H, 0
09            ADD HL, BC
A7            AND A
ED 52         SBC HL, DE
7D            LD A, L
E1            POP HL
77            LD (HL), A
21 00 80      LD HL, 32768
22 04 40      LD (16388), HL
C9            RET
```

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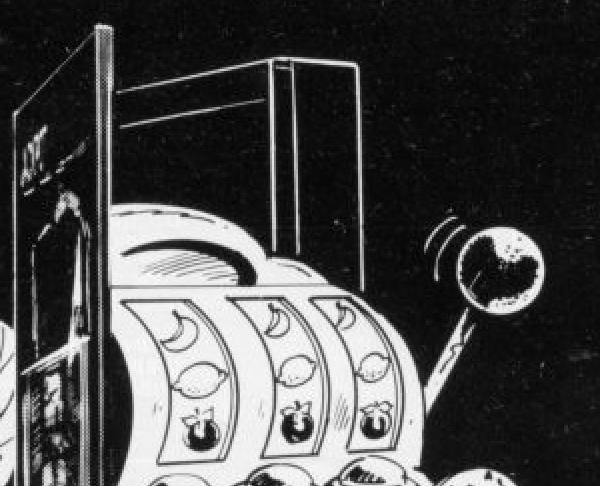
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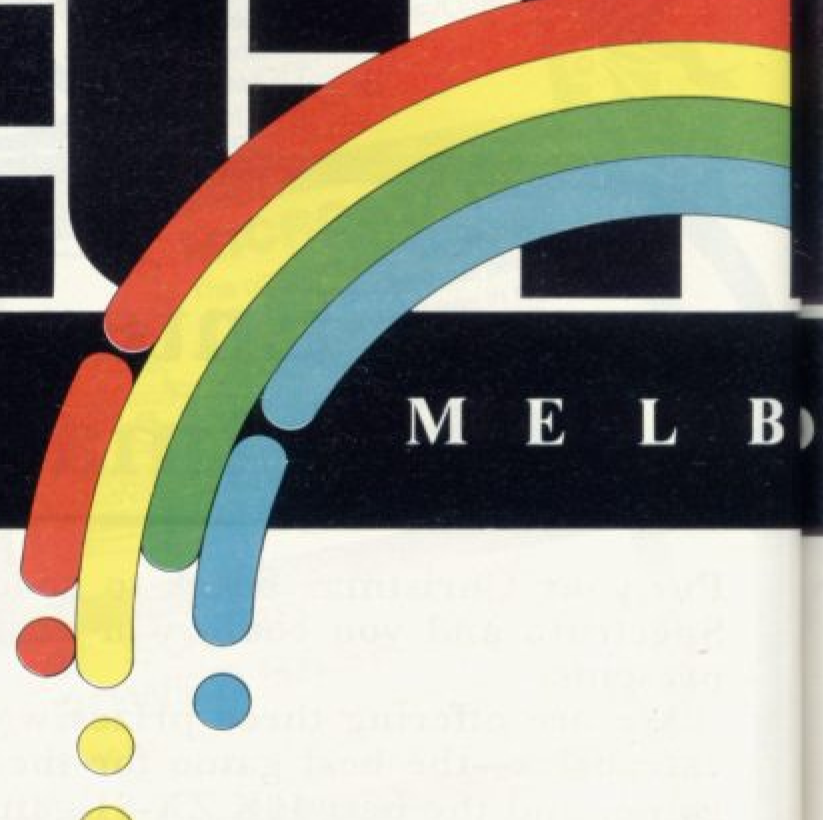
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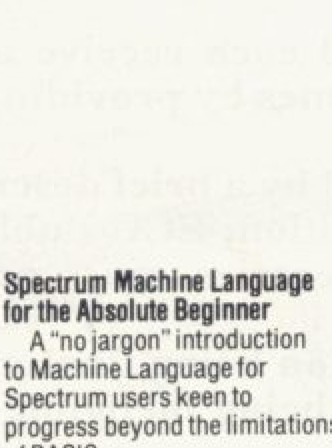
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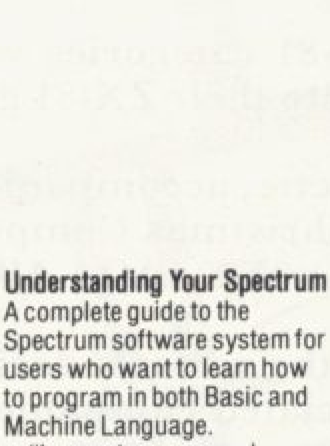
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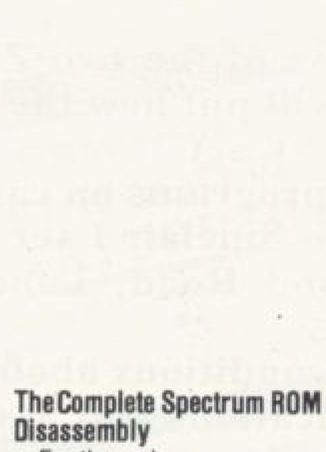
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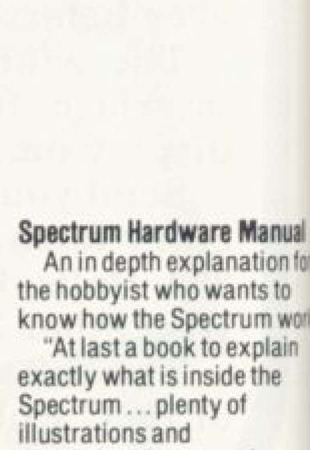
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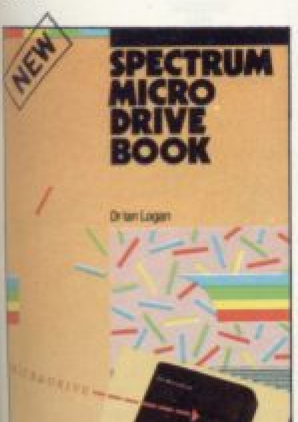
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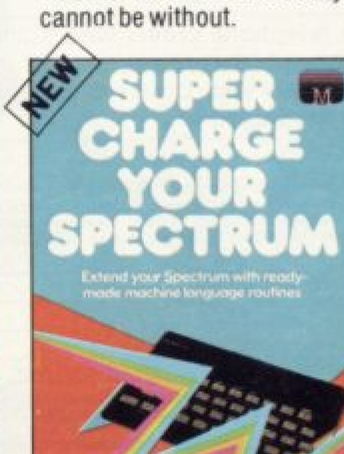


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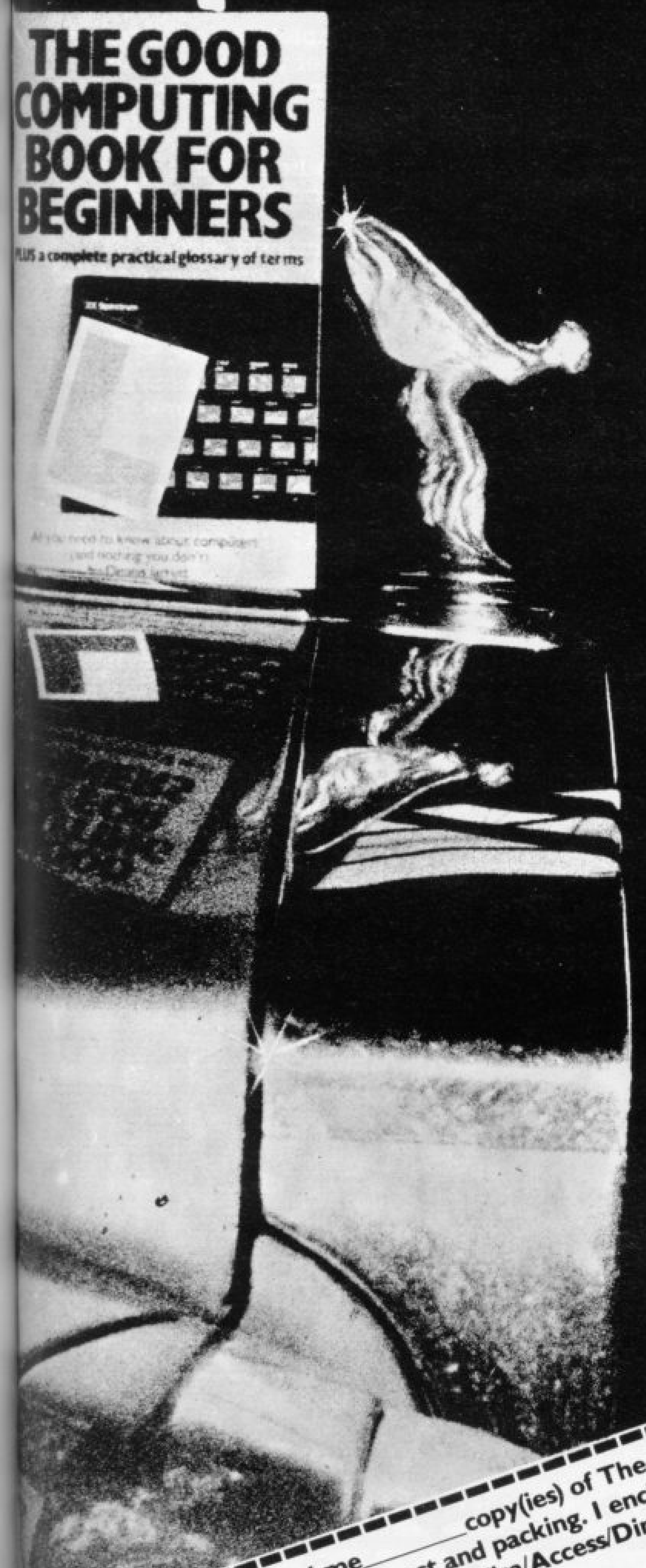
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Masking interruptions is worth the effort

Andrew Hewson suggests ways of producing continuous sound



● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

AN INTERESTING point about the Spectrum is raised by Michael Rodway of Cambridge, who writes: **I have noticed that a small number of commercial games produce sound continuously while the program is running. How is that effect achieved?**

The simplest technique is to call a sound routine at various points during the execution of the program but usually that creates an intermittent effect because it is difficult to arrange the calls to the routine so that they occur at regular intervals. The only altenative is to use the interrupt system built into the Z-80 microprocessor. This is a difficult task but the result is usually worth the effort involved.

The interrupt system, as its name implies, is a mechanism by which the processor can be diverted from the task it is undertaking to do something more urgent. When the processor has completed the more urgent task it resumes its previous job. All computers have an interrupt system and on more sophisticated machines they allow the computer to maintain a priority system for all the tasks it has in hand at any moment.

```
 10 DATA 62,0,237,71,201
 20 FOR I = 23296 TO 23300
 30 READ A
 40 POKE I,A
 50 NEXT I
 60 FOR I=0 TO 255
 70 POKE 23297,I
 80 RANDOMIZE USR 23296
 90 PRINT AT 0,0;
100 FOR J = 32 TO 127
110 PRINT CHR$ J;
120 NEXT J
130 PAUSE 9999
140 NEXT I
```

Table 1. A Spectrum program to demonstrate the interference on the TV display caused by setting the I register in the range 64 to 127.

A low-priority task is deferred in favour of a more urgent one which, in turn, is suspended while a yet more urgent job is started, and so on. As each task is completed the machine reverts to a previous, half-completed job.

Two types of interrupts can occur in the Z-80. The more important is the Non-Maskable Interrupt—or NMI—so-called because the programmer is unable to prevent, or mask, the Z-80 from responding to such an interrupt when it occurs. The NMI is not of much interest to most Spectrum programmers because it is designed for use with external hardware.

The maskable interrupt is of more interest because it can be switched off, so that all subsequent interrupts are ignored, and because the Z-80 can be set to respond to it in any one of three modes. In mode zero the processor waits until it is directed by an external device to execute a routine somewhere in memory. In the Spectrum there is no provision for the use of this mode.

The Spectrum is designed to operate in mode one all the time. In that mode the Z-80 saves the contents of the program counter—so that it can later resume the task it was doing—and jumps to location 38h—56 decimal. The Spectrum hardware forces the jump to be made by generating an interrupt 50 times per second.

The ROM routine at this address updates the clock by incrementing the FRAMES systems variable held at 23672 to 23674 and then scans the keyboard to see if a key is being pressed. If so, the appropriate code is stored in the system variables and various flags are altered. On completion of the keyboard routine all the registers are restored to their previous values and the processor resumes its previous task.

The final interrupt mode, mode two, is the most powerful. If the Z-80 is interrupted while in that mode it saves the program counter as previously and jumps to an address determined partly by software and partly by the hardware which caused the interrupt. To be more specific, the Z-80 takes the value in the I register and the value generated by the external hardware and calculates an address from them as:

Address = 256 * I register + hardware

It then looks at the contents of the calculated address and the subsequent

Decimal	Assembler	Comment
237 86	im 1	Re-set interrupt mode one
62 63	ld a,63	Re-set I register
237 71	ld i,a	to 63
201	ret	End
62 24	ld a,24	Load FRAMES system variable
50 118 92	ld (23670),a	with the instruction
62 133	ld a,133	to jump back
50 119 92	ld (23671),a	to 23549
62 195	ld a,195	Load last three bytes
50 253 91	ld (23549),a	of printer buffer
62 39	ld a,39	with instruction
50 254 91	ld (23550),a	to jump back
62 91	ld a,91	to
50 255 91	ld (23551),a	23335
62 37	ld a,37	Load I register
237 71	ld i,a	with 37
237 94	im 2	Set interrupt mode two
201	ret	End
58 120 92	ld a,(23672)	Transfer clock value
50 116 89	ld (22900),a	to an attribute square
255	rst 56	Call clock and keyboard routines
201	ret	End

Table 2. Three Spectrum routines to be loaded into the printer buffer which together allow the user to select either interrupt mode one or two.

one and calculates a new address from them as:

New address = Address + 256 * (Address + 1)

It then jumps to the new address. Thus if the I register contained 143 and the hardware generated the value 27, the Z-80 would look at the contents of:

256 * 143 + 27 = 36635 and 36636

If those two locations contained 137 and 93 respectively—i.e., PEEK 36635 = 137 and PEEK 36636 = 93—it would then jump to location:

137+256 * 93 = 23945

The rather complicated procedure is known, aptly, as an indirect jump and is not so cumbersome as it seems at first sight. It enables as many as 128 types of devices to be attached to the Z-80, each type generating its own value to contribute to the indirect jump address. The programmer then constructs a table containing 128 addresses, each held in two bytes and each pointing to the routine which handles a particular device. The I register points to the location of the beginning of the entire 256-byte table.

The Spectrum does not use interrupt mode two and the designers have used the I register for their own purposes connected with the scanning system for the TV screen. The initialising routine in ROM puts the value 63 into that register and if any value between 64 and 127 is loaded instead, interference occurs with the TV display.

To see the effect, load and run the program listed in table one. The program puts a short machine code routine into the printer buffer which loads a value into the I register. The Basic loop increments the value loaded into I and shows the effect on some PRINTed characters.

I know of no cure for the interference on the screen and would be interested to hear from anyone who might be able to suggest one. The effect is to restrict the area of memory which a Spectrum programmer may use to hold the pointer for a mode two interrupt. A few moments' calculation shows that any address between 16384 and 32767 inclusive will require the I register to be set to some value in the range 64 to 127. As that is the entire area of RAM available in the 16K Spectrum, it would appear that interrupt mode two cannot be used in these machines.

There is a way round the problem. If there is no hardware connected to the 16K Spectrum, the low byte of the indirect address will take the value 255 by default. We can safely set the I register to any value in the range 0 to 63 inclusive. Suppose we choose to set the I register to 37. When an interrupt occurs in mode two the Z-80 will then look at the two addresses:

256 * 37 + 255 = 9727 and 9728

to determine the location to which it should jump. The two addresses are, of course, in ROM and they contain 118 and 92 respectively so that the Z-80 will jump to:

118 + 256 * 92 = 23670

That location is in the system variables area and usually is used to hold the SEED for the generation of the next random number. A relative jump instruction to the printer buffer, or anywhere else close by, can be placed here instead of the seed without great loss. Provided the user takes care not to execute a RANDOMIZE command the instruction will not be over-written.

There are several other values which could be placed in the I register which would cause an indirect jump to an address in RAM but for my purposes here 37 is the most suitable. Table two lists three machine code routines designed to be loaded into the printer buffer which switch between interrupt modes one and two and make use of the technique. They can be loaded using the decimal loader given in table three.

```
10 FOR I = 23296 TO 23548
20 INPUT J
30 PRINT I,J
40 POKE I,J
50 NEXT I
```

Table 3. A Spectrum program for loading machine code in decimal into the printer buffer.

The first routine, loaded at 23296, restores interrupt mode and re-sets the value in the I register to 63 if required. The second routine establishes the chain linking the SEED system variable, first to the end of the printer buffer and then to the address of the beginning of the third routine. It then alters the value in the I register to 37 and sets mode two.

Thus when the routine is executed the Spectrum no longer jumps to the ROM clock and keyboard routine, at address 50, 50 times per second. Instead it jumps via SEED and the end of the printer buffer to the third routine.

The third routine, just to prove that the system works, transfers from FRAMES into the attributes area, causing a single square on the screen to change colour rapidly. A call is then made to the ROM clock and keyboard routine so that the Spectrum continues to function correctly.

The third routine can be extended to generate continuous sound by adding a suitable call to the beeper routine which is located in the ROM at address 949. An example is given in table four. Note that the contents of many of the registers are saved by pushing them on to the stack before the beeper routine is called.

Decimal	Assembler	Comment
221 29	push ix	Save registers
245	push af	
197	push bc	
213	push de	
229	push hl	
17 10 00	ld d,10	Determines frequency * duration
33 132 1	ld hl,388	Determines duration
205 181 3	call 949	Call beeper routine
243	di	Disable interrupt
255	pop hl	Restore registers
209	pop de	in reverse order
193	pop bc	
241	pop af	
221 225	pp ix	
205 191 2	call 703	Call clock and keyboard
201	ret	End

Table 4. A Spectrum routine to be added to the routine in table two starting at 23336 which calls the beeper routine.

That step is necessary because the beeper routine uses those registers and the routine which was interrupted will have almost certainly been using them for its own purposes.

For more complex interrupt service routines it may be necessary to save all the registers and some of the system variables as well.

The tone produced by the beeper routine is determined by the contents of de and hl. The values shown give a note about two octaves above middle C. All

continued on page 167

continued from page 165

completion of the routine by popping the values in reverse order from the stack.

A number of readers have written asking for an opinion on the Microdrive now that it has finally appeared.

A typical question is from Tom Pendlebury of Holt, who asks: **Is it possible to pick out a single item from a Microdrive file or must the whole file be read into memory?**

The software in the interface which controls the Microdrive is fairly elementary so that the use of a Microdrive file is restricted in a number of important ways. For example, if a file already exists on a cartridge it is possible only to read it, not to write to it, so that corrections can be made only by reading the file into memory, making the correction, erasing the Microdrive copy and then writing the corrected file back on to the cartridge.

Similarly, it is not possible to read a single item, as Pendlebury asks, although it is possible to read part of a file so that if the information required is near the beginning only the first part needs to be read.

There is no doubt that the Microdrive is another Sinclair value-for-money innovation and I am sure that software will be developed to extend the facilities provided.

To help set the ball rolling I have written the Basic Bootstrap program listed in table five, which allows the user to select whichever program he requires from the Microdrive cartridges.

The program generates a catalogue of the files on the cartridge selected by the user, reads the catalogue into memory and erases the cartridge copy, so that an up-to-date copy is always generated. The Bootstrap program then loads the program selected by the user.

This rather convoluted approach is used because it would appear that the Microdrive does not maintain a catalogue of the files on each cartridge, so that the catalogue must be re-generated each time the program is used. I may be incorrect about this conclusion—I have not had the Microdrive long enough to be certain. If I am wrong I shall no doubt be deluged with letters pointing out the error.

```
  1 LOAD *"m";d;b$(1): STOP
 10 PRINT "Microdrive Bootstrap Program"
 20 INPUT "Enter microdrive number ";d
 30 IF d<1 OR d>8 THEN GO TO 20
100 REM Create temporary catalogue
110 OPEN #4;"m";d;"catalogue"
120 CAT #4;d
130 CLOSE #4
200 REM Read catalogue
210 DIM a$(50,10)
220 OPEN #4;"m";d;"catalogue"
230 FOR i = 1 to 50
240 INPUT #4;a$(i)
250 IF a$(i,1)> = "0" AND a$(i,1)< = "9" THEN GO TO 300
260 NEXT i
300 REM list and erase catalogue
310 CLOSE #4
320 LET n = i-2
330 PRINT "Drive #";d;" Cartridge ";a$(1): PRINT
340 FOR i = 3 TO n
350 PRINT a$(i)
360 NEXT i
370 ERASE "m";d;"catalogue"
400 REM Choose file
410 DIM b$(1,10)
420 INPUT "Enter file name ";b$(1)
430 FOR i = 3 TO n
440 IF b$(1) = a$(i) THEN GO TO 500
450 NEXT i
460 INPUT "No such file. Try again (y/n) ?";c$
470 IF c$(1) = "y" THEN GO TO 420
480 STOP
500 REM Load file
510 CLS
520 GO TO 1
```

Table 5. A Spectrum Bootstrap to load programs from a Microdrive determined by the user. Save the Bootstrap on Microdrive 1 by entering: SAVE * " m " ; 1 ; " run " LINE 10.

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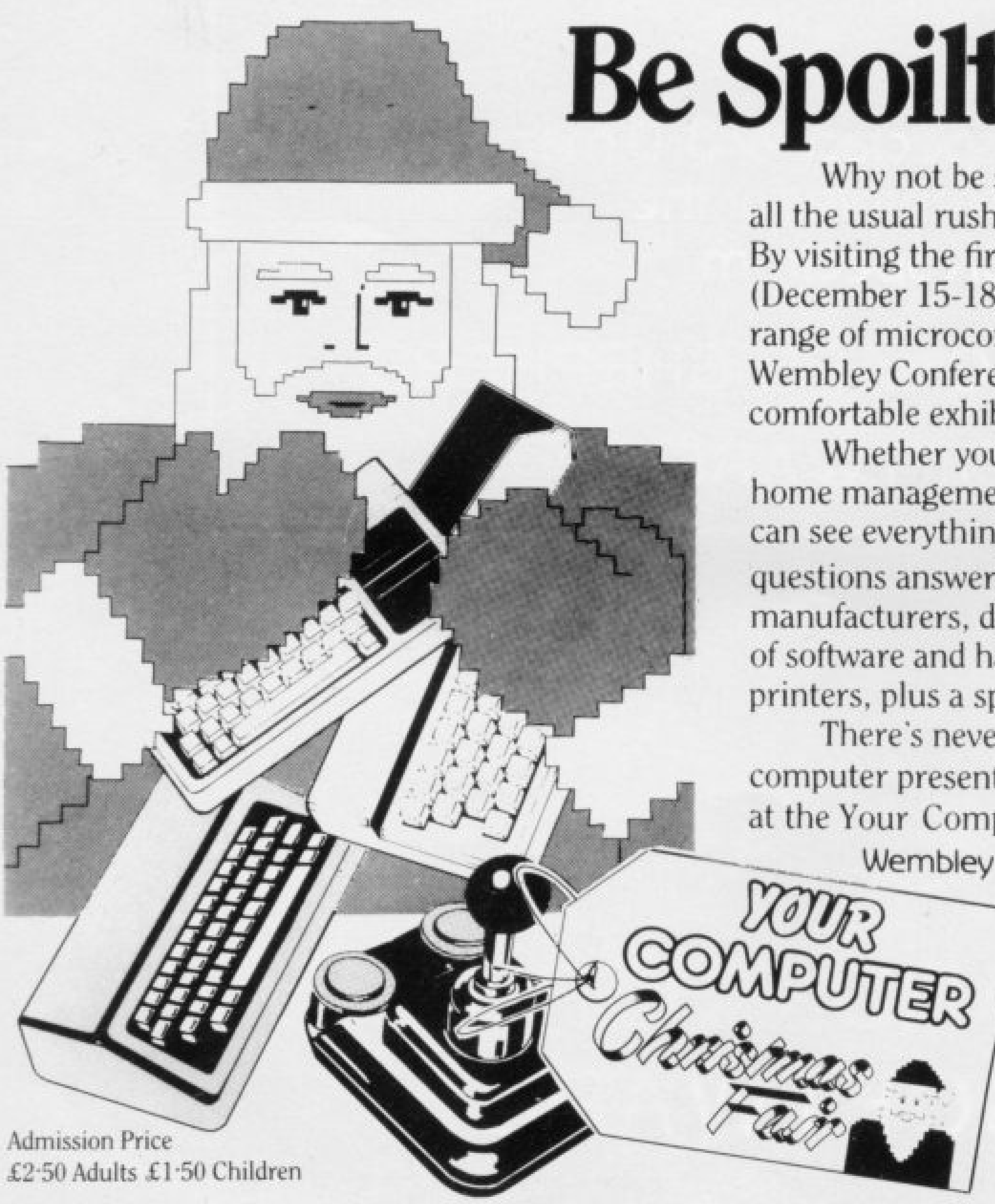
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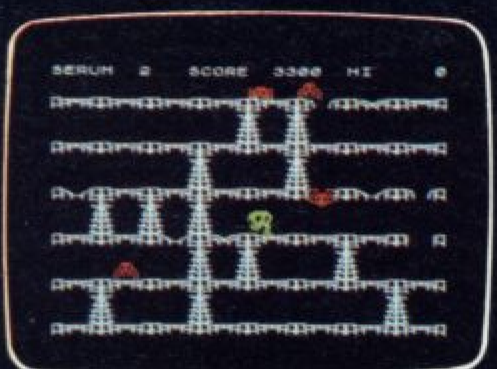
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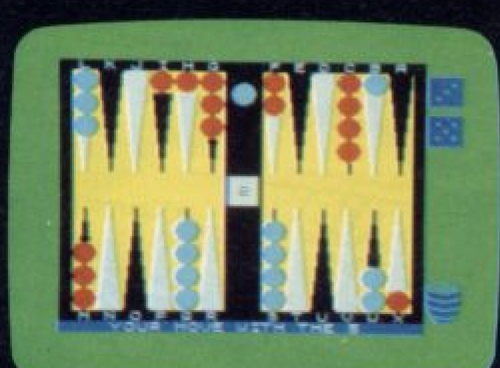
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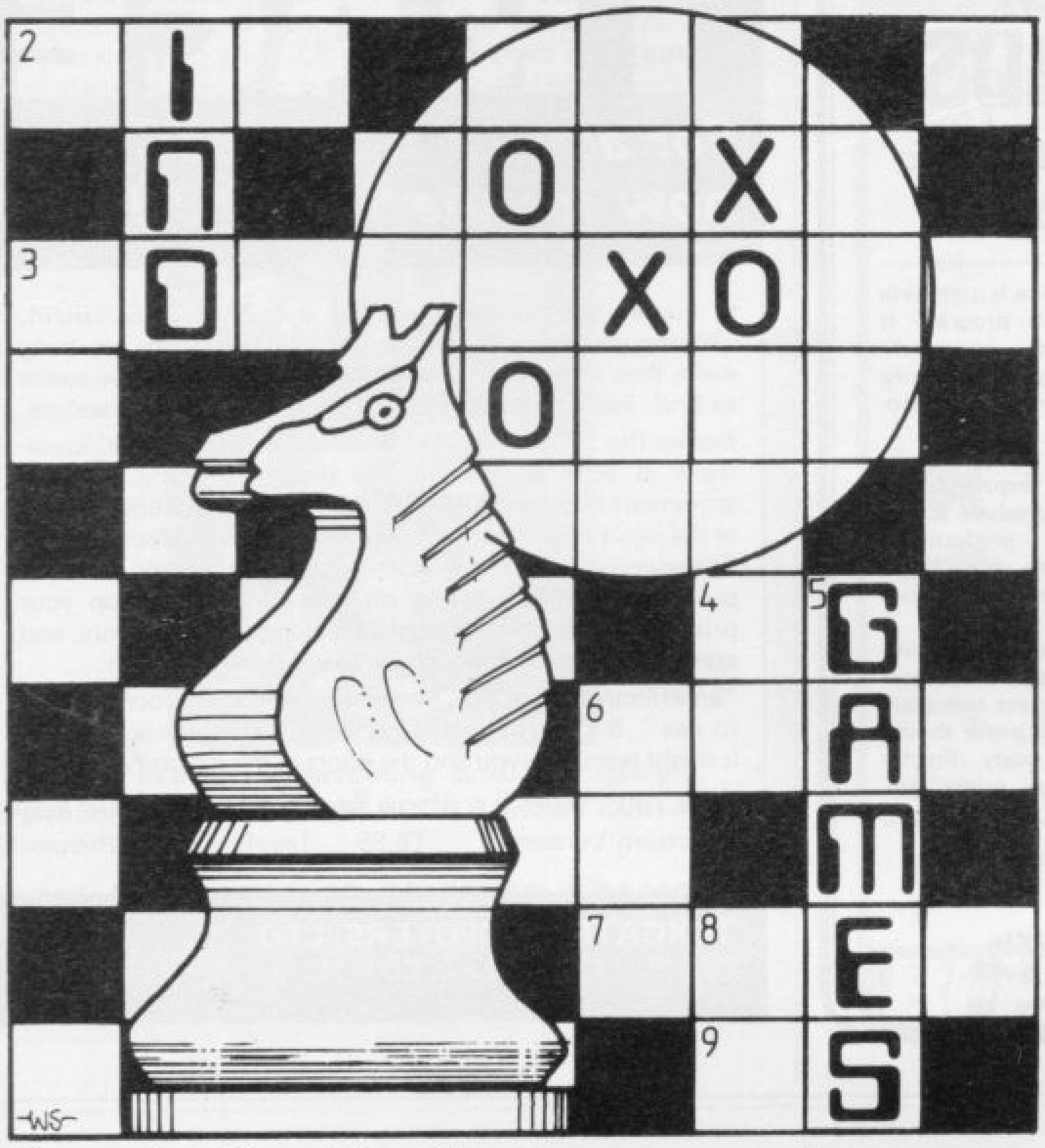
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Quentin Heath's Christmas round-up

Favourite adventures

CHRISTMAS will be different this year for parents and children alike as they embark on Christmas shopping. The software market has reached such a state that parents will have even more difficulty when trying to choose a present. Instead of a Lego set, **The Hobbit** will be 'in-thing'. Action Man is out and **The Wrath of Magra** or **Black Crystal** is 'in'.

For this reason I am giving parents some hints on the best buys where the new adventure and strategy games are concerned. I also want to give children some ideas of what the new games are like.

One of the best sellers this year has been The Hobbit and it is still selling well. It has managed to stay in the W H Smith Top Ten for about eight months, except for a short time in September when seasonal factors were called into play.

The reason for its success is its apparent intelligence at communicating with the player, and the graphics which have also featured as a main selling point.

The so-called intelligence of the game results from an operating system in the program. It allows the player to type-in more than the usual verb-noun replies which are available to most other adventure games.

The other intelligent factor is that the characters continue to 'live out their lives' even when the player is away from the keyboard.

Artic Computing has caused more consternation and bafflement with the release of its adventures A, B, C and D for the Spectrum and ZX-81 through Sinclair Research. Many people have had intellectual trouble with the games, mainly because they could not solve them.

The adventures are difficult to get to grips with but Artic assures me that they are solvable.

The new Artic release, Adventure E, is called the **Golden Apple.** It centres on the quest for the Golden Apple on which you travel extensively, especially across the sea to an island where all kinds of mythical mayhem takes place. I will be dealing with the new adventure early next year.

The popular mail order selection this Christmas includes three adventures from Carnell Software. They are **Volcanic Dungeon, Black Crystal** and **The Wrath of Magra.** Those three games form a set, The Wrath of Magra being the newest. They form a world of myth and mystery which should be of interest to most adventure game players.

Both Black Crystal and The Wrath of Magra are graphics adventures and they give some idea of the type of world which Carnell has created. Black Crystal is in Basic but, far from slowing the game, it provides just the level of speed with which the player can cope. I dealt with Black Crystal in September and no doubt The Wrath of Magra will prove of sufficient interest for me to include next year.

No Christmas round-up would be complete without the spawn of Automata. The creator of **Pimania,** the only game in the universe which does not seem to have a solution, has a follow-up called **My Name is Uncle Groucho, You Win A Fat Cigar.** It is another adventure game starring the Piman and Groucho. It has the same type of wacky humour sickeningly apparent in Pimania.

If you decide to buy it you will be able to enter a competition which includes a trip on the QE II for the winner.

Enough of adventure games. Christmas is a time of dark evenings, a time when children and adults get into the mood to play games or solve puzzles. There are plenty of puzzles for both ZX-81 and Spectrum to occupy the mind and two of the best are the **'L' Game** and a new release from Sinclair Research, **Flippit.**

I hope that I have provided you with some ideas about the mind games on the market, especially those suitable as Christmas presents. You should not have too much difficulty deciding what to buy even though there is a wide area to cover.

Melbourne House, 131 Trafalgar Road, Greenwich, London, SE10 — The Hobbit.
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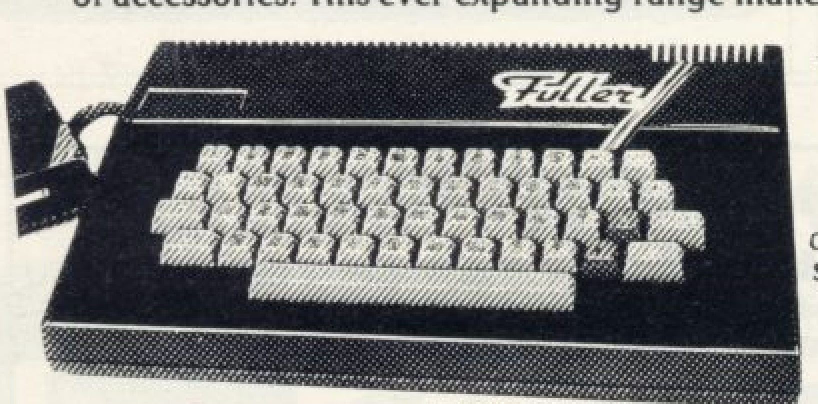
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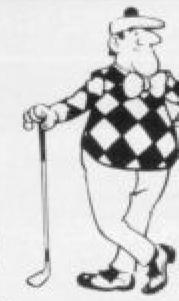
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To all purchasers of Sinclair Small Business Accounts for ZX Spectrum

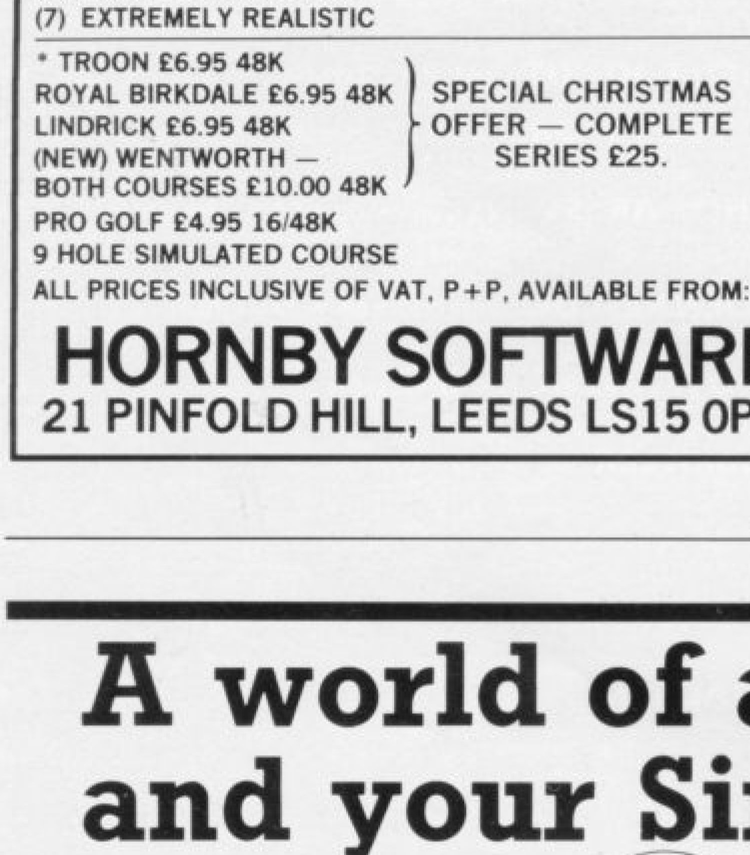
It has come to our attention that there is an error in some copies of the above program. We are anxious to minimise the inconvenience to purchasers and are therefore taking prompt action to inform you and offer a replacement free of charge.

If you have a copy of this program and it bears the code B6/S on the box spine please store any data on a separate cassette and then return the product with its packaging and user manual **and your name and address** to:

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Stanhope Road,
Camberley,
Surrey, GU15 3PS.

We will send you a replacement copy.

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Whether you have a ZX80, ZX81 or Spectrum — we can show you there's far more to your Sinclair than you ever thought possible. That's the *active*, *lively* world of **Sinclair User** — the first magazine written specially for everyone who owns or uses a Sinclair computer.

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sinclair special

5



Inside... New Interface 2 and ROM cartridges! New Software!

TAKING NEW SOFTWARE IN NEW DIRECTIONS

You'll see that this issue of Sinclair Special devotes considerable space to software. Why, when we've so much to say about hardware and peripherals? Simply because at Sinclair we believe in supporting first-class hardware with first-class software.

This month sees the start of a new commitment to education in our catalogue, both for adults and children.

In the field of micro theory, we've programs like Beyond BASIC and Make-a-Chip, which take you from the creation of simple ZX assembler subsets to simulated circuit design projects.

There's Musicmaster, to teach you music terminology, note values and composition.

And if you're keen to beat your Spectrum at chess (which can be hard), you'll certainly want to try Chess Tutor 1, the first program in a complete chess masterclass.

Coming soon...

In the pipeline are many new releases, some of which break completely new ground. LOGO and micro-PROLOG for instance. They're fifth generation languages which will take you and your Spectrum closer than ever before to the creation and application of artificial intelligence.

A formal agreement between Sinclair and Macmillan Education has been announced, the first results of which will be published this autumn. These consist of five programs in a complete early reading course plus the first four of a series of programs based on Macmillan's top selling Science Horizons Scheme. All programs are designed for use in schools or the home.

And with Blackboard software, we're publishing six more home education programs for primary school children. Covering alphabet, spelling and punctuation, each of these programs is a true gem, unlike any other education software, and fascinating to run. Even for adults!

I believe that these new titles represent a major advance in educational software for the home.

New ROM software too!

You may well have heard news of ZX Interface 2 and ROM cartridge programs. You'll find full details of the Interface and its software on the facing page (and there's an order form on the back page too!). These offer an instant games playing facility at unbeatable prices, and expand the possibilities of using your Spectrum in yet another direction.

Alison Maguire

Alison Maguire
Applications Software Manager

SOFTWARE UPDATE

The latest cassette software for ZX Computers



Chess Tutor 1
For 48K RAM Spectrum. **£9.95.**

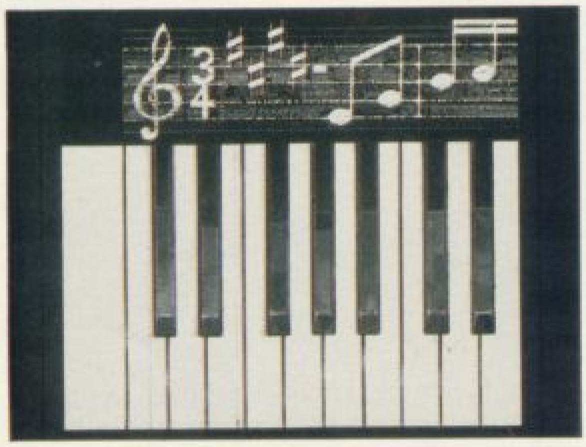
Chess Tutor is a new way of learning all about chess – using your ZX Spectrum.

It starts from the beginning by teaching you about the chess pieces and the way they move – including castling, en passant, promotion, check, checkmate, stalemate and perpetual check.

Then it teaches you the basic tactics – pins, forks, double attacks and skewers.

There are over 120 exercises and over 200 questions for you to answer – with demonstrations and hints from your ZX Spectrum when you want them.

You can choose which parts of the course you want – and even experienced players may be surprised at what they can learn from Chess Tutor.

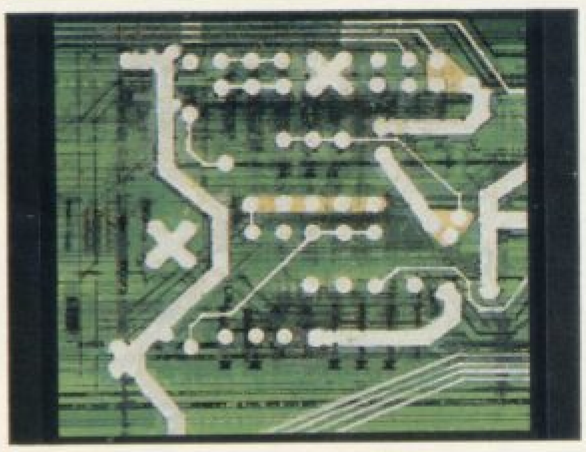


Musicmaster
For 48K RAM Spectrum. **£9.95.**

Musicmaster turns your ZX Spectrum into a musical instrument which will not only play tunes, but will also demonstrate key signatures, durations of notes, and scales.

You can write your own tunes – in any key – play them over and over again, save them on tape, modify them.

You can either write your music on a stave, or place a simple overlay on your Spectrum for a 17-note keyboard.

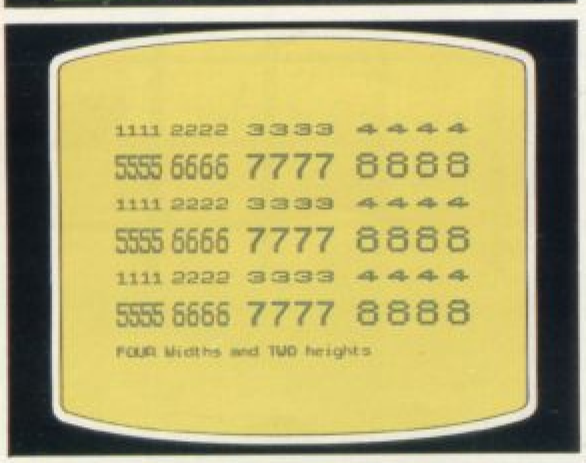


Make-a-Chip
For 48K RAM Spectrum. **£9.95.**

Make-a-Chip teaches you the basic elements of circuit design, shows you how they fit together, and then lets you design and test your own circuits.

When you have designed a circuit, you can give it inputs and outputs and your ZX Spectrum will check it for you. Then it will run it, or tell you what's wrong so that you can modify it.

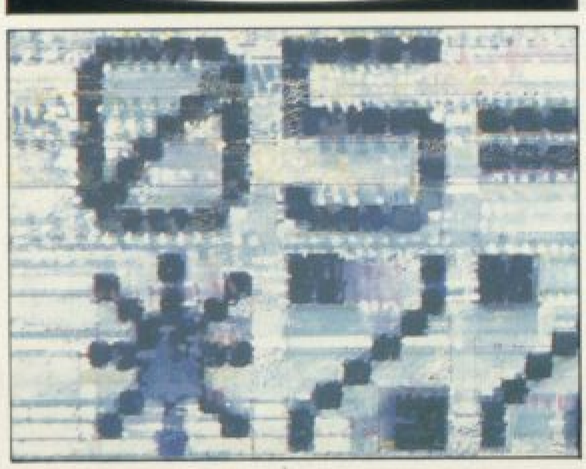
Make-a-Chip is a fascinating way of finding out how computer logic works.



Print Utilities
For 16K and 48K RAM Spectrum. **£9.95.**

Increase the printing and display facilities of your ZX Spectrum with the Print Utilities program.

Print Utilities enables you to enhance your programs by generating characters of eight different sizes which you can place anywhere on your screen.



Beyond BASIC
For 48K RAM Spectrum. **£9.95.**

Takes the agony out of assembler. Takes the mystery out of machine code.

Beyond BASIC gives you a deeper insight into the workings of your ZX Spectrum. It explains what happens inside your micro when you run a program, and it teaches you simple Z80 machine code programming.

A major feature of Beyond BASIC is that it enables you to write your own Z80 assembler programs – then you can actually see on your screen how they affect the ZX Spectrum memory and registers.

ZX INTERFACE 2

The New ROM Cartridge/Joystick Interface

Loads programs instantly! Takes two joysticks! Just plug-in and play!

The ZX Interface 2 is the latest new peripheral for the ZX Spectrum system. It enables you to use new ZX ROM cartridge software: plug-in programs that load instantly. It allows you to use two standard joysticks, without the need for separate, special interfaces.

To use new ZX ROM cartridge programs, just connect Interface 2 to the rear of your Spectrum or Interface 1 and plug in the cartridge of your choice. The program is then loaded, ready to run!

You can use any joystick that has a 9-way D plug. Use one or two of them for extra fun with ZX ROM cartridge or Sinclair cassette programs – or with dozens of other Spectrum-compatible programs!



SEE BACK PAGE FOR ZX INTERFACE 2 AND ROM CARTRIDGE ORDER FORM!

...AND BRAND NEW ROM CARTRIDGE SOFTWARE!

There's already plenty of choice of ZX ROM cartridge programs for your Spectrum. Some are old favourites, in an exciting new form. Others are new.

And now, thanks to ROM cartridge technology, you can run them *all* on a 16K RAM Spectrum, even if they were originally written only for 48K machines!

Every ROM cartridge program loads fast and faultlessly. No wires, no waiting, no worries about loading errors! All of them are affordably priced too, at £14.95.

Backgammon



Everything you need to play the famous and deceptively simple board game. Board, stones, rolling dice and doubling dice are shown in full colour and high resolution. Choose from four levels of skill to suit experts and beginners alike – full rules are included.

Space Raiders



Your skill is all that's stopping successive waves of aliens from destroying Earth. Use your gun base to attack. Shelter behind buildings... move out and blast the passing alien soaceship!

Full-colour high-resolution graphics with sound.

New! PSSST



Robbie the Robot sits in his garden. Help him fetch compost to cultivate his prize Thyrgodian Megga Chrysanthodil. Help him make the right choice of pesticide, to ward off devilish insects. Stop the insects breeding to overwhelming numbers before Robbie's plant has bloomed. PSSST is horticulture with a horrendous twist!

One and two player option, with a host of features including sound effects.

Chess



This sophisticated program does everything you'd expect at board game level, and much more besides.

The high-resolution chessboard and pieces are arranged in a row and column system, so it's easy to key in your moves.

At any stage of the game you can request the computer to suggest a move, reverse roles or change the level of skill.

Full-colour high-resolution graphics.

Planetoids



Dodge and swerve using your thrust button, turn on a planetoid... fire! But beware – the alien ship moves fast to destroy you with cluster bombs. And when it comes to the crunch, use your hyperspace button!

Full-colour high-resolution graphics with sound.

Hungry Horace



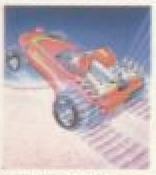
Horace is forever being chased around the park by guards.

He steals their lunch, eats pathway flowers and creates chaos in the park by ringing the alarm!

You'll have to be quick to keep Horace out of trouble!

Full-colour high-resolution graphics with sound.

New! Tranz Am



Set in a future time ruled by cars and trophies, in a land where petrol replaces gold, and status is possession of the 8 Great Cups of Ultimate.

Driving your Super Blown Red Racer, use your skill to outwit and crash the Deadly Black Turbos. Use your instruments to locate and collect the trophies – before you overheat or run out of fuel.

A program with outstanding multi-directional movement, graphic features, and a playing area equivalent to more than 600 times actual screen area.

Horace and the Spiders



Guide Horace on the hazardous journey to the cobwebbed house full of poisonous spiders.

Safely in the house, you must move along cobwebs, choose a spot... and jump on it! The spiders will be in a frenzy – scuttling to repair their precious web.

And when a spider is spinning a new section, you're safe to attack and destroy it!

Kill all the spiders, and a new web appears... with even more spiders to catch.

Full-colour high-resolution graphics.

New! Cookie



You're Charlie the Chef, who keeps his ingredients locked in the larder. But if the ingredients escape, they bring the inedible Nasties with them!

You must daze the escaping ingredients with flour bombs, and knock them into the mixing bowl. Stop them getting into the dustbin, at all costs! And beware of Nasties that get into the mixing bowl!

Cookie is fast-moving panic in the pantry, with a cast of real characters. A program to make you smile – and sweat!

New! Jet Pac



As Chief Test Pilot of the Acme Interstellar Transport Company, your task is to deliver and assemble spaceship kits. On your way round the galaxy, you're free to collect precious stones and gold.

The catch? Rocket fuel is precious and scarce. And the aliens don't take kindly to the theft of their valuables. You'll need your wits and your lasers!

With a host of features, including multi-directional movement, explosions, sound effects and one and two player option.

ZX MICRODRIVE





NOW ON RELEASE

The ZX Microdrive System – as you'd expect from Sinclair – is unique to the world of computing. It's a compact, expandable add-on system which provides high-speed access to massive data storage. With just one Microdrive alone (and Interface 1), you'll have at least 85K bytes of storage, the ability to LOAD and SAVE in mere seconds, the beginnings of a local area network of up to 64 Spectrums, *and* a built-in RS232 interface! The cost? Less than £50 for each Microdrive.

How to get ZX Microdrive

Spectrum owners who bought direct from us, by mail order, have been sent full details. Order forms are being mailed in strict rotation, so if you haven't yet received your order form please bear with us. We're making good progress in meeting the huge demand.

If you didn't buy your Spectrum by mail order, don't worry. Send us the form from the bottom of this page. We'll add your name to the mailing list, and send you details by return.

Each Microdrive costs £49.95. Interface 1 costs £49.95, but just £29.95 if purchased with a ZX Microdrive. Extra ZX Microdrive cartridges: £4.95.

How to order

Simply fill in the relevant sections on the order form below. Note that there is no postage or packing to pay on some purchases. Orders may be sent FREEPOST (no stamp needed). Credit card holders may order by phone, calling 01-200 0200, 24 hours a day. 14-day money-back option, of course. Please allow 28 days for delivery.

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey, GU15 3PS. Telephone: (0276) 685311.

To: Sinclair Research Ltd, FREEPOST, Camberley, Surrey, GU15 3BR.

ORDER FORM

Section A: Hardware

Qty	Item	Code	Item Price £	Total £
	ZX Interface 2	8501	19.95	
	ZX Spectrum – 48K	3000	129.95	
	ZX Spectrum – 16K	3002	99.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
			TOTAL £	

Section B: Software **ROM CARTRIDGE PROGRAMS**

	G12/R	Planetoids	5302	14.95
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	G13/R	Hungry Horace	5303	14.95
	G24/R	Horace and the Spiders	5305	14.95
	G28/R	PSSST	5307	14.95
	G30/R	Cookie	5309	14.95
	G29/R	Tranz Am	5308	14.95
	G27/R	Jet Pac	5306	14.95
	G22/R	Backgammon	5304	14.95
	G10/R	Chess	5301	14.95

CASSETTE PROGRAMS for ZX Spectrum

	E9/S	Chess Tutor 1	4308	9.95	
	E7/S	Musicmaster	4306	9.95	
	E8/S	Beyond BASIC	4307	9.95	
	E6/S	Make-a-Chip	4305	9.95	
	L5/S	Print Utilities	4404	9.95	
				TOTAL £	

*I enclose a cheque/postal order made payable to Sinclair Research Ltd for £ ______

*Please charge to my Access/Barclaycard/Trustcard account no:

*Delete/complete as applicable.

Signature

Mr/Mrs/Miss

Address

SPR 912

(Please print)

ZX Microdrive information request

Please add my name to the Microdrive Mailing List, *and* send me a colour brochure with full specifications of ZX Microdrive/Interface 1 ☐ *(tick here).* You can use the above form to send us your name and address.

GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 186

continued from page 140

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

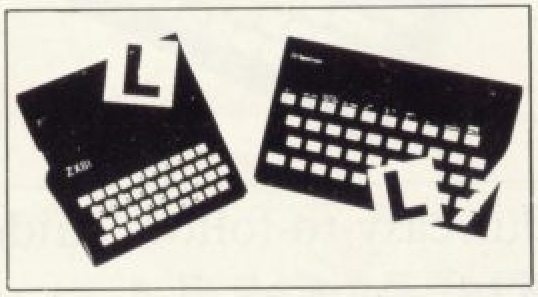
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

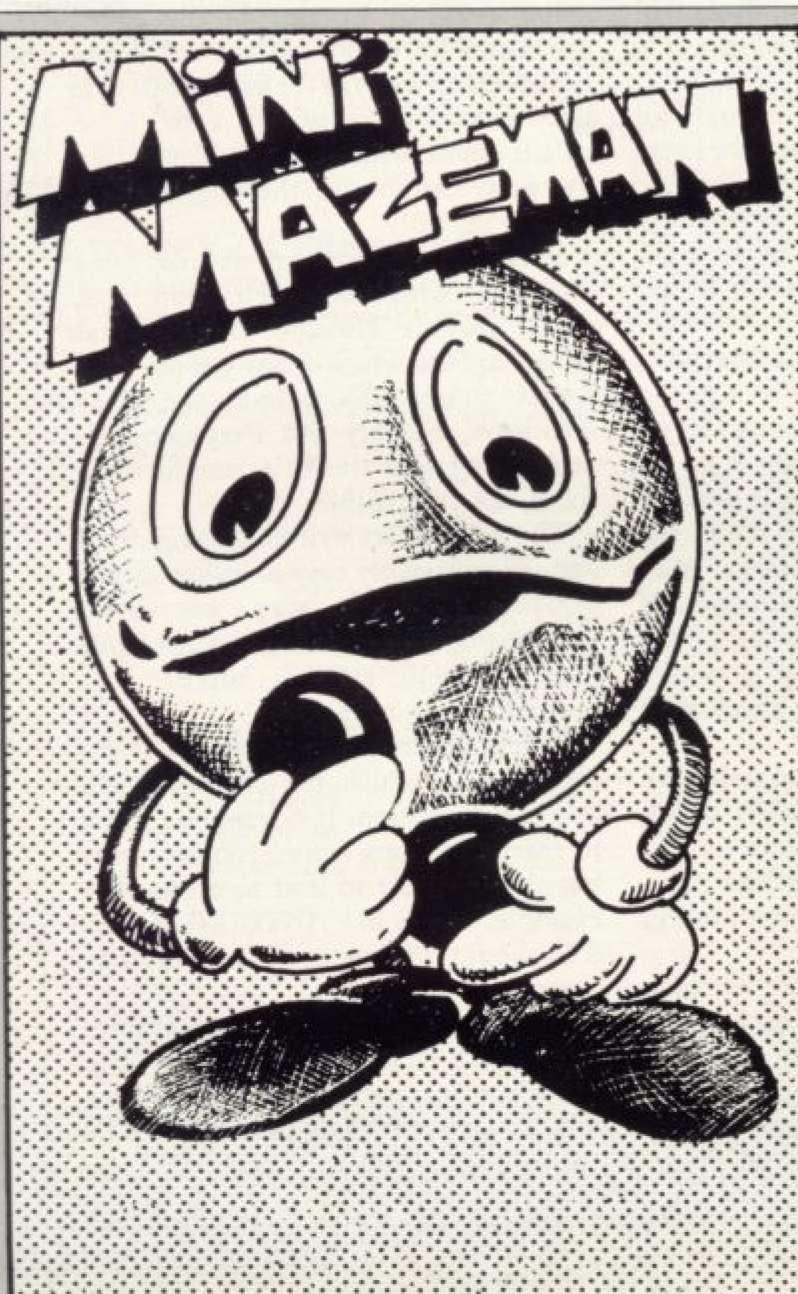
Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD " " followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.



MOVE YOUR figure around the board using the cursor keys 5 to 8. Your aim is to eat as many of the power pills as possible before you are caught by the invisible ghost. **Mini Mazeman** was written for the 1K ZX-81 by V McCarthy of Limerick, Ireland.

```
   2 PRINT "mini maze man enter
level"
   6 INPUT A
  10 LET S=0
  16 CLS
  20 LET Q=1
  22 LET W=1
  24 LET R=INT (RND*7)+1
  30 LET E=INT (RND*7)+1
  60 FOR F=1 TO 10

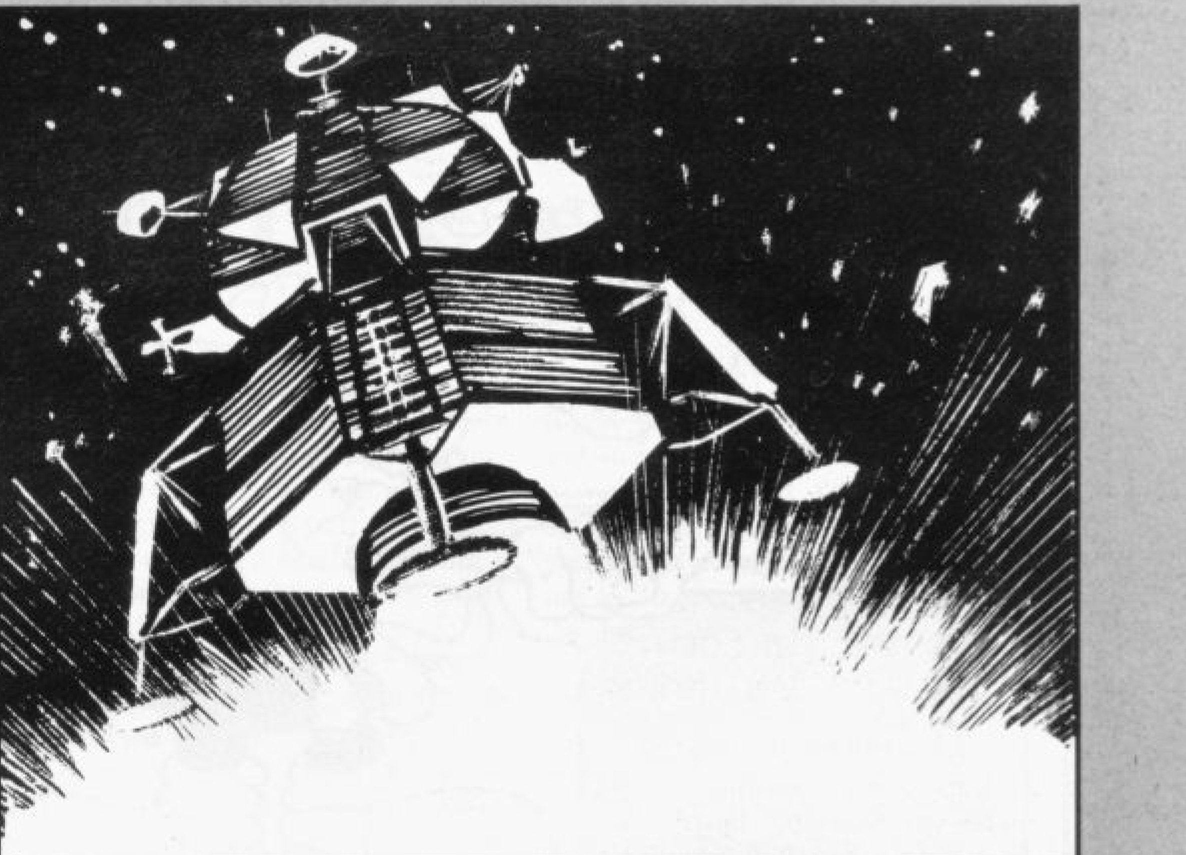


 100~PRINT "(10*i.)"
 110 NEXT F
 150 PRINT AT Q,W;"o"
 200 IF PEEK (PEEK 16398+256*PEE
K 16399)=155 THEN GOSUB 1000
 300 LET Q=Q+(INKEY$="6" AND Q<8
)-(INKEY$="7" AND Q>1)
 310 LET W=W+(INKEY$="8" AND W<8
)-(INKEY$="5" AND W>1)
 316 IF Q=R AND W=E THEN GOTO 20
00
 318 IF RND<A THEN GOTO 150
 320 PRINT AT R,E;CHR$ 11
 324 IF PEEK (PEEK 16398+256*PEE
K 16399)-128 OR 155 THEN PRINT A
T R,E;"(i$P)"



 330 LET R=R+(Q>R)-(Q<R)
 340 LET E=E+(W>E)-(W<E)
 400 GOTO 150
1000 LET S=S+1
1010 PRINT AT Q,W;"(i$P)"
1090 RETURN
2000 PRINT S
```

Moon Lander



```
 1 LET A=INT (RND*10000)+4000
 2 LET Q=18
 3 CLS
 4 PRINT AT 0,23;"FUEL:";Q;" "
 5 PRINT "DIST=";A
 6 LET G=(9.8/A)*1000
 7 IF G>70 THEN LET G=70
 8 PRINT "GRAV=";G
 9 PRINT "R.O.D (-60 TO 999 KM
S/M)?"
10 INPUT Z
11 PRINT "TIME (0 TO 9)?"
12 INPUT X
13 LET A=INT (A-(Z*X)-G)
14 IF A<0 THEN GOTO 19
15 IF A=0 THEN GOTO 22
16 LET Q=Q-1
17 IF Q=0 THEN GOTO 25
18 GOTO 3
19 PRINT "*CRASH*"
20 PAUSE 4E4
21 RUN
22 CLS
23 PRINT "LANDING SUCCESSFUL"
24 GOTO 20
25 PRINT "*NO FUEL*"
26 GOTO 19
```

TRY TO LAND your rocket on the moon successfully. The distance to be travelled and the gravity force which is affecting you will be displayed on the screen. From that information enter the rate at which you wish to descend and the time for which you wish to descend at that rate. As the pull of gravity becomes stronger, your rate of descent may have to be a negative number. Be careful not to run out of fuel.

Moon Lander was written for the 1K ZX-81 by Richard Muse of Romford, Essex.

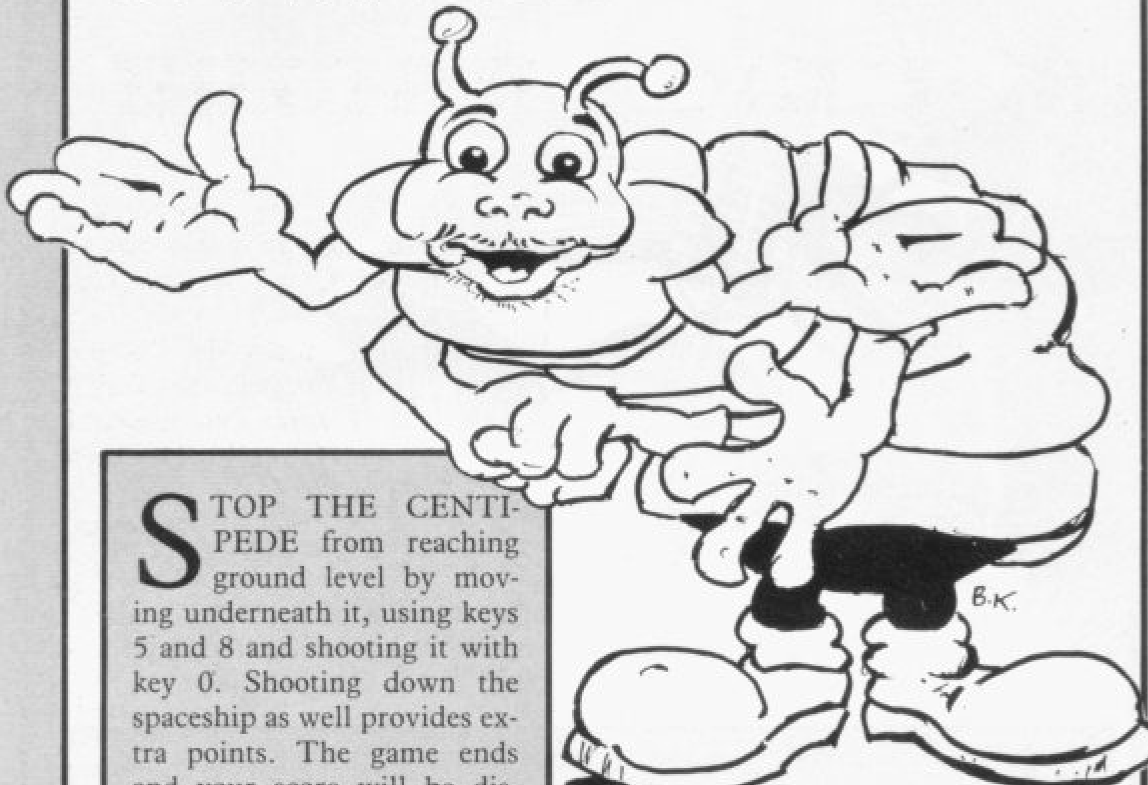


Program Protector

SINCLAIR USER has received several queries as to how a program can be protected from unauthorised users. Add this short routine by Marjan Klenovsek of Celje, Yugoslavia to your programs, and LISTing will become useless. A listing will be produced but the numbers in it will be scrambled. This gives the impression that the program listing is correct, although it will later be found on entering it that this is not the case.

```
9990 LET n=5+PEEK 10344+034*PEEK
 40640: LET va=PEEK 49289+932*PE
EK 73476
9991 CLS : PRINT AT 47,71;"CIPHE
RING!"
9992 IF PEEK n=91 THEN  LET p=n:
 GO TO 6165
9993 LET n=n+5
9994 IF PEEK n<>86 AND n<va THEN
  GO TO 3522
9995 IF PEEK n=01 AND n<va THEN
 LET n=n+0: GO TO 0998
9996 CLS : PRINT AT 10,10;"DONE!
": STOP
9997 LET p=p-4
9998 IF (PEEK p>69 AND PEEK p<52
) OR PEEK n=19 THEN  POKE p,(INT
 (RND*59)+78): GO TO 8631
9999 GO TO 4899
```

CENTIPEDE

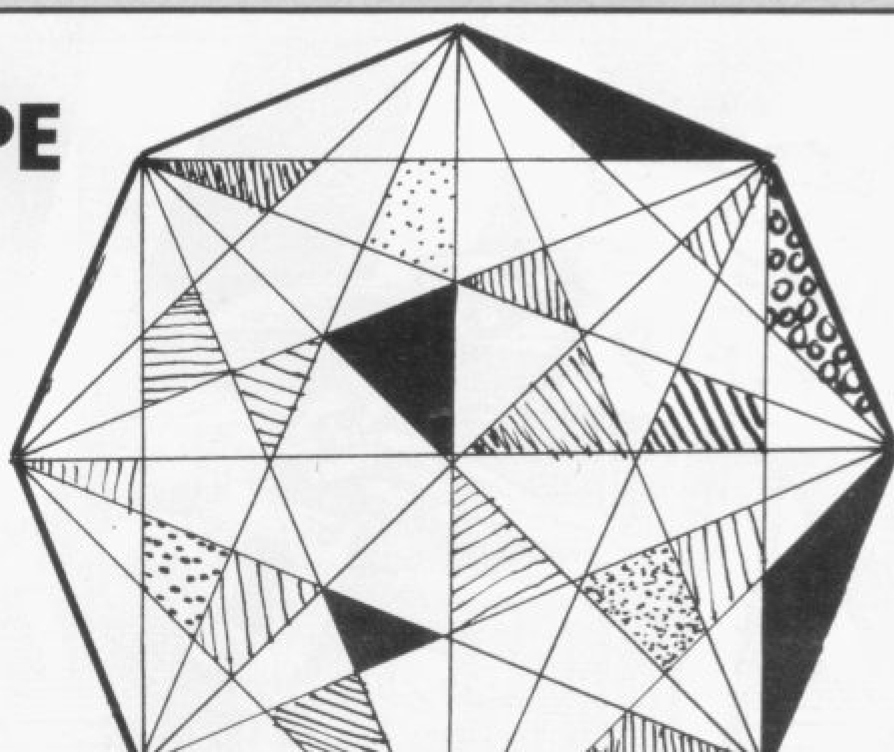


STOP THE CENTIPEDE from reaching ground level by moving underneath it, using keys 5 and 8 and shooting it with key 0. Shooting down the spaceship as well provides extra points. The game ends and your score will be displayed when the centipede reaches the ground.

Written for the 16K ZX-81 by Robert Hodge of Ashton-under-Lyne, Lancashire.

```
   1 REM CENTIPEDE
   2 LET P=-5
   3 FAST
   4 CLS
   5 PRINT AT 0,0;"(2*isP)centiP
ede attack  by r hod9e(3*isP)";A
T 1,0;"(32*9f)"
   6 LET P=P+5
   7 FOR S=2 TO 21
   8 PRINT AT S,0;"(32*isP)";AT
RND*18+2,RND*30;"(i.)";
   9 NEXT S
  10 LET M=15
  11 SLOW
  12 FOR F=3 TO 3
  13 LET E=INT (RND*30)+1
  14 FOR D=2 TO 28
  15 PRINT AT 2,D;"(99:9h:99)";A
T 2,D-1;"(isP)"
  20 LET M=M+(INKEY$="8")-(INKEY
$="5")
  40 PRINT AT 20,M;"(i0)";AT 20,
M-1;"(isP)";AT 20,M+1;"(isP)"
  41 PRINT AT 21,0;"(32*ix)"
  42 GOTO 46
  43 PRINT AT 10,0;"you are inva
ded    score= ";P;AT 14,0;"Press
"r" for another 9o "
  44 IF INKEY$="R" THEN GTO 1
  45 GOTO 44
  46 PRINT AT F,E;"(io:i-)";AT F
,E-1;"(i-)";AT F+1,E-1;"(i(:i":i
)"
  47 NEXT F
  48 IF INKEY$="0" THEN PRINT AT
 19,M;"(9h)";AT 19,M;"(i*(";AT 1
9,M;"(i+)";AT 19,;"(isP)"
  49 IF M=D+1 AND INKEY$="0" THE
N GOTO 8000
  60 IF M=E AND INKEY£="0" THEN
GOTO 7000
 50C IF F>=20 THEN GOTO 6100
 501 NEXT D
5000 GOTO 14
6100 GOTO 43
7000 PRINT AT F,E;"(9w)";AT F,E;
"(9e)";AT F,E;"(9r)";AT F,E;"(9q
)";AT F,E;"(9a)";AT F,E;"(i*)"
7100 GOTO 3
8000 PRINT AT 2,D;"(97) (97)";AT
 2,D;"(3*isP)"
8100 LET P=P+10
8200 GOTO 14
```

KALEIDOSCOPE TITLES



KALEIDOSCOPE TITLES by Frederic Dambly of Brussels, Belgium for the 16K or 48K Spectrum provides a colourful way of giving the title or instructions for a program. Change the words in DATA line 140, keeping them within inverted commas and separated by brackets to bring your messages to the screen.

```
  50 FOR b=0 TO 6: BORDER b: INK
 b: CLS
  51 READ z$: PRINT AT 10,9;z$
  70 FOR a=0 TO 175  STEP 5
  71 INK INT (RND*7)
  80 PLOT 0,0: DRAW 255,a
  81 PLOT 255,0: DRAW -255,a
  82 PLOT 0,175: DRAW 255,-a
  83 PLOT 255,175: DRAW -255,-a
  90 NEXT a
 100 FOR a=255 TO 0 STEP -5
 101 INK INT (RND*7)
 110 PLOT 0,0: DRAW a,175
 111 PLOT 255,0: DRAW -1,175
 112 PLOT 0,175: DRAW a,-175
 113 PLOT 255,175: DRAW -a,-175
 120 NEXT a
 130 NEXT b
 140 DATA "KALEIDOSCOPE","A NEW
WAY","OF PRESENTING","YOUR PROGR
AMS","","DAMBLY 1983",""
 150 STOP
```

Trapping the errors will ensure first-time running

THE FIRST error code encountered by most Sinclair users is the flashing "S" on the ZX-81 or "?" on the Spectrum, which indicates a syntax error in a sentence. Experience and the manual soon show that it is caused usually by typing-in a keyword letter by letter, or by bad punctuation, for example omitting a semi-colon or an inverted comma.

The most frequently-occurring error code is "2" — variable not found. A variable is a letter which has been given a numeric value. When you enter "LET a=2" you are defining a variable. Error code 2 results when the computer reaches a variable in the program to which you have so far given no value.

Check the line which the computer specifies. If it is your program, give a value to the variable or remove it. If you are copying the program, look back in the listing to see which line you have missed.

Although the majority of error codes are explained adequately in the manuals, the report "B-Integer out of range" can be confusing. An integer is a whole number — 1 is an integer, 1.5 and 1½ are not. That code occurs most frequently when you try to print something beyond the limits of the screen.

PRINT AT 0,31; "a" is acceptable and will print a letter "a" at the top right of the screen. PRINT AT 0,32; "a" would not be possible. The integer 32 would be out of range, resulting in error code "B". That would also happen if the computer were instructed to PRINT AT 0,31;"ab". It would still be trying to print a character beyond the limits of the screen.

That error is more difficult to detect if variables have been used as co-ordinates and your character, or series of characters, is being printed in varying positions. If the instruction PRINT AT 0,x;"a" produces report code B, make sure that the value of x never increases beyond 31.

On the Spectrum "B-integer out of range" is also often found when you are POKEing-in user defined graphics. The biggest number which can be POKEd-in this case is 255 or BIN 1111111. In that case the error code will occur in the line containing the POKE statement. In most cases, though, the error will have occurred in one of the DATA lines in the program.

A very frequent error code produced on the Spectrum is "E-Out Of Data". That will occur in a line containing a READ statement. The error code, though, will have occurred in one of the program DATA lines, which may be nowhere near the READ line. A READ command sends the computer to a DATA line to collect the next piece of DATA contained there. That is often done using a FOR, NEXT loop, especially when graphics are being set up.

FOR n=1 TO 8: READ n will send the computer to the DATA lines eight times, for eight separate pieces of information. If there are only seven pieces of DATA there it will return to the READ line and produce the code OUT OF DATA. When there are several DATA lines they will all have to be checked, because the piece of DATA you have omitted was not necessarily the last.

In some cases the computer will follow the program correctly, without producing an error code, but from the programmer's point of view the program contains an error. In that case BREAK into the program at the moment it goes wrong. That will produce report code 9 and the line on which you have STOPped the program. That method makes it easy to locate the area of the program which contains the error.

Programs which you copy from magazines, books or from friends can be difficult to error-trap because they contain programming techniques which you have not yet learned, or simply because it is often difficult to follow another programmer's logic.

The flashing "S" or "?" indicating a syntax error may appear frequently. In that case check carefully what you have copied. You may not have recognised words such as LN or EXP as keywords.

On the ZX-81 especially it is easy to forget that pressing "π" will produce the word PI.

Make sure that when the "is not equal" sign, "<>" appears in a listing you always enter it as one character and not as "is less than", "<" followed by "is greater than", ">".

Technical problems can also cause errors in programs. Any alteration to the power supply can cause a program to CRASH. In that case the screen display may change dramatically and using the keyboard will have no effect. The only solution is to unplug your computer and begin again, making sure that your power supply and RAM pack are both connected firmly. That error is caused by the computer and not by the program.

> 'The error need not be on the line which produces the report; that is simply the line where the computer meets the problem'

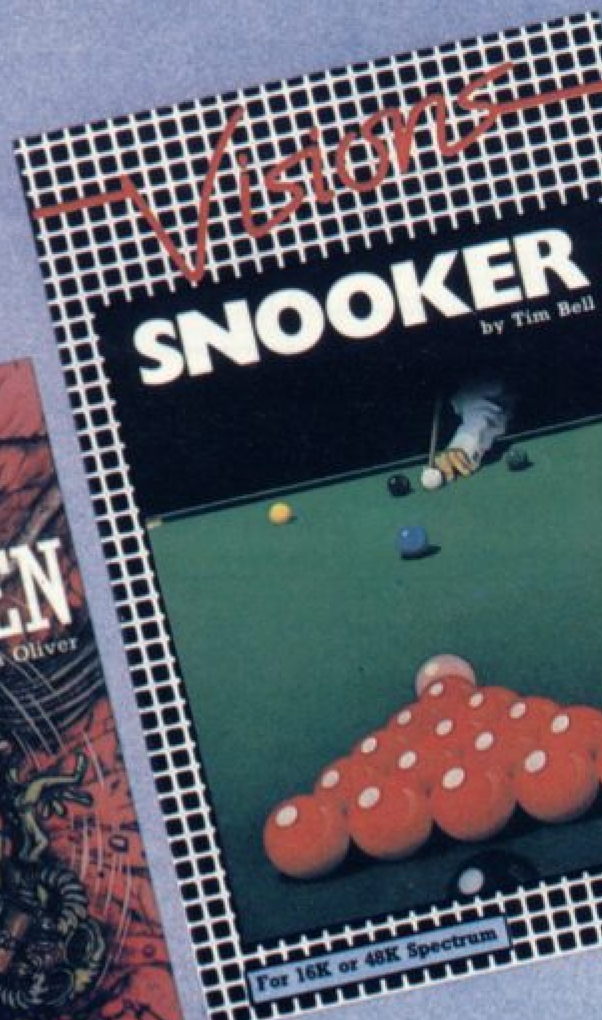
Sometimes a program listing in a book or magazine will contain what seems to be a very obvious error. If it contains key words or symbols which are not on your computer, check that it is intended for your machine. Programs for the Spectrum, the ZX-81 and the ZX-80 are not usually directly interchangeable. If a program contains the command GOTO or GOSUB — a non-existent line number — the computer will simply go to the next numbered line after that one. That is a sign that a program has been developed and improved and is rarely an error.

When you have errors in a program, first check the report codes listed in Appendix B of the manual. It may then be necessary to read the appropriate section of the manual. Remember that the error is not necessarily on the line which produces the report code; that is simply the line where the computer meets the problem for the first time.

Always check carefully every line connected with the line containing the error code and the mistake should be easy to locate.

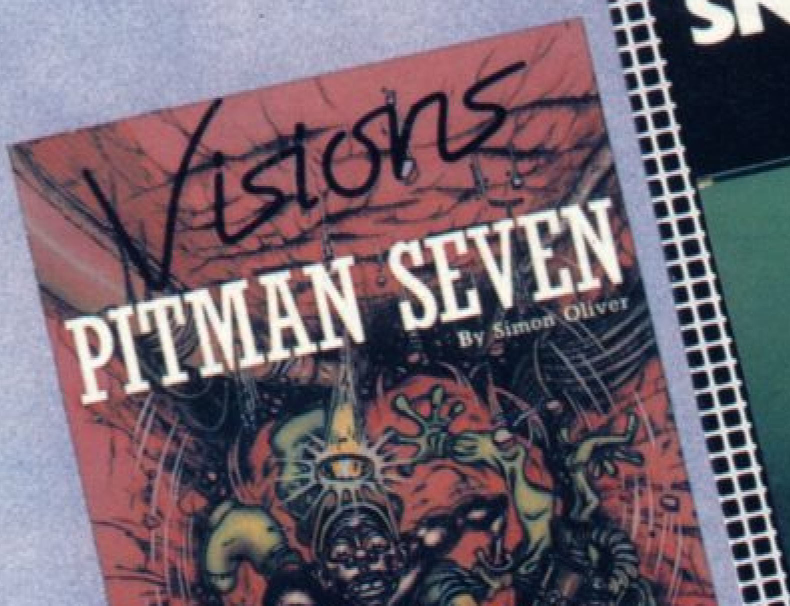
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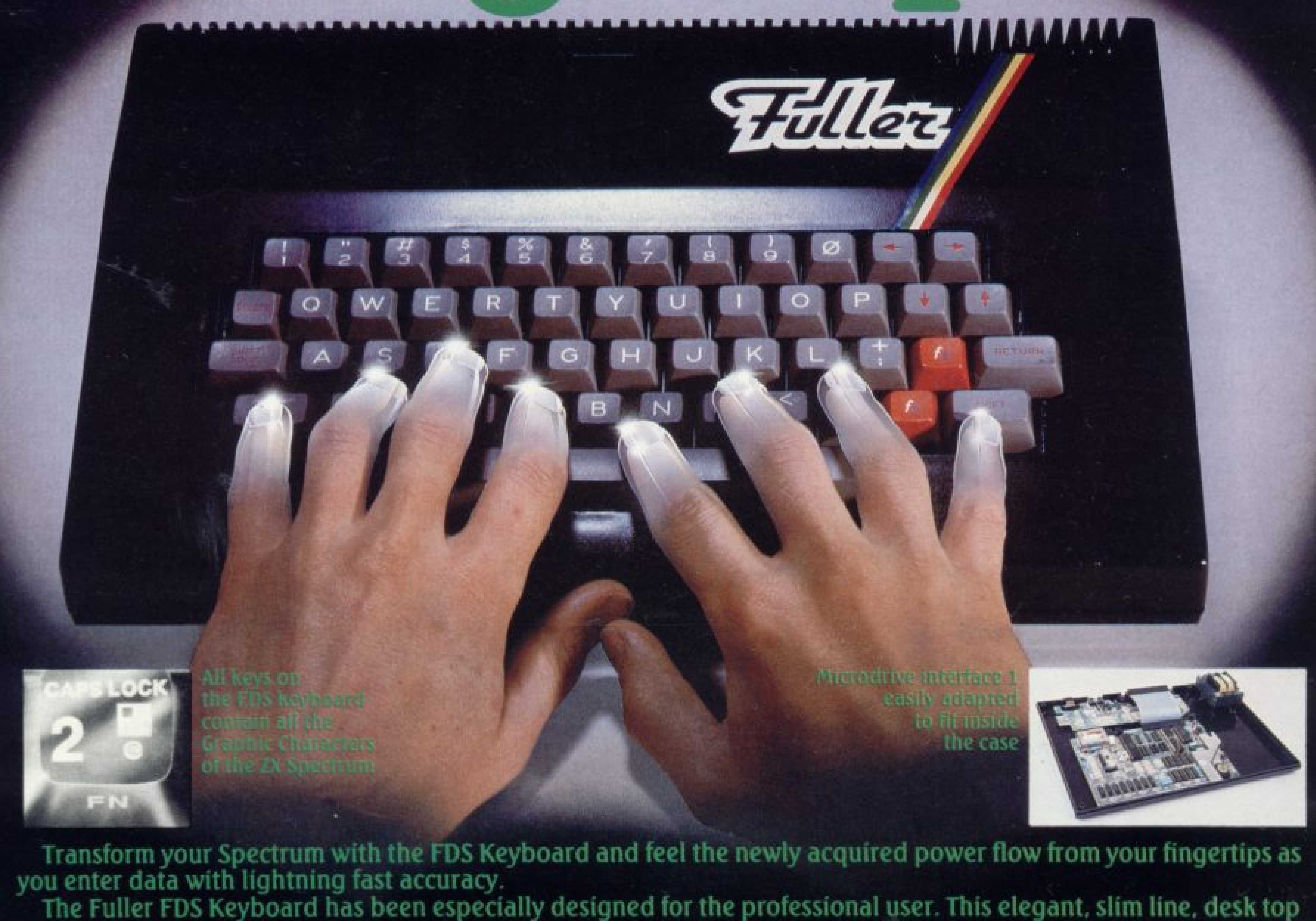
Name ______

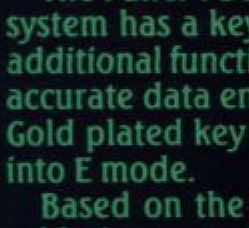
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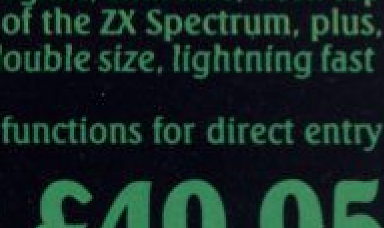
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SOFTWARE DIRECTORY

OUR NEW software listings service has been welcomed by readers. This month, and from now on, we are publishing the full list, updated with the latest releases such as Maziacs from dK'Tronics and Spectipede from R and R.

If we have reviewed a cassette we shall give it a rating known as the Gilbert Factor, named after our software reviewer John Gilbert. Although the final figure is out of 10 it is the result of a complicated calculation involving a number of factors which are taken into account when assessing how good a cassette is.

The factors include value for money, the layout of the screen instructions, conciseness of the program and its speed of operation, the accomplishment of the task it aims to achieve, the innovation of concept, and the use it makes of the machine.

While trying to ensure that all software is dealt with it is inevitable that some will be omitted. We will remedy any omissions later.

Any suggestions for the improvement of this list will be welcomed.

Name	Machine	Company	Type	Gilbert factor
ABC Liftoff	48K Spec.	Longman	Education	*
Accounts (Sole Trader)	48K Spec.	Hestacrest	Business	*
Accounts (Limited Company)	48K Spec.	Hestacrest	Business	*
Accounts (Sole Trader)	16K ZX-81	Hestacrest	Business	*
Accounts (Limited company)	16K ZX-81	Hestacrest	Business	*
Address Manager	48K Spec.	OCP	Business	7
Adventure 1	48K Spec.	Abersoft	Adven.	6
Adventure 1	16K ZX-81	Abersoft	Adven.	6
Adventure Isl.	48K Spec.	Contrast	Adven.	*
Airline	16K ZX-81	CCS	Sim.	*
Airline	48K Spec.	CCS	Sim.	*
Airliner	16K Spec.	Protek	Sim.	*
Air Traffic Controller	16K Spec.	Hewson	Sim.	6
Alien Dropout	16K ZX-81	Silversoft	Arcade	*
Allsort S-1	48K Spec.	A Firminger	Utility	7
Alphabet	16K Spec.	Widget	Education	*
Android One	16K Spec.	Vortex	Adven.	*
Apocalypse	48K Spec.	Red Shift	Mind Game	*
Arcadia	16K Spec.	Imagine	Arcade	5
Arcadian	16K Spec.	J K Greye	Arcade	*
Armageddon	48K Spec.	Silversoft	Arcade	*
Aspect	16K Spec.	Bug Byte	Utility	5
Assassin	16K Spec.	Spectrasoft	Arcade	*
Assembler	48K Spec.	Artic	Utility	6
Asteroids	16K ZX-81	Silversoft	Arcade	*
Asteroids	16K ZX-81	Software Farm	Arcade	6
Astral Convoy	16K ZX-81	Vortex	Arcade	*
Astrology	16K Spec.	Stellar Servs.	Utility	7
Astrology	16K ZX-81	Stellar Servs.	Utility	*
Audio Sonics	16K Spec.	Work Force	Utility	4
Auto Chef	16K Spec.	CCS	Sim.	*
Auto Chef	16K ZX-81	CCS	Sim.	*
Avenger	16K Spec.	Abacus	Arcade	*
Backgammon	48K Spec.	CP	Mind Game	*
Backgammon	16K Spec.	Hewson	Mind Game	*
Bank Account Syst.	48K Spec.	K Gouldstone	Business	8
Bank Raid	16K ZX-81	J M Senior	Game	*
Barrow Quest	16K ZX-81	Sherry	Adven.	*
Base Invaders	48K Spec.	Work Force	Arcade	6
Battle of Britain	48K Spec.	Microgame	Strat.	*
Battleships	16K ZX-81	JRS	Strat.	*
Beamscan	48K Spec.	Hilderbay	Utility	*
Beamscan	16K ZX-81	Hilderbay	Utility	*
Beamscan	48K Spec.	Beamscan	Utility	*
Big Match Soccer	16K Spec.	Winters	Strat.	*
Biorythms/Pyramids of Egypt	16K Spec.	Spectrasoft	Game	*
Black Crystal	48K Spec.	Carnell	Adven.	7
Black Crystal	16K ZX-81	Carnell	Adven.	7
Black Dwarf's Lair	48K Spec.	Newsoft	Adven.	*
Black Hole	16K Spec.	Quest	Arcade	6
Black Planet	48K Spec.	Phipps	Adven.	7
Blind Alley	16K Spec.	Sunshine	Arcade	7
Brain Damage	48K Spec.	Silversoft	Arcade	*
Breakaway	16K Spec.	Procom	Arcade	*
Brewery	48K Spec.	P Boulton	Strat.	*
Bridge Master	16K/48K Spec.	Bridge Master	Trad.	9
Bridge Tutor	16K Spec.	CP	Mind Game	*
Business Bank Account	48K Spec.	Transform	Business	*
Business Bank Account	16K ZX-81	Transform	Business	*
Byter	16K ZX-81	Protek	Arcade	*
Calpac 1	16K Spec.	Calpac	Education	*
Calpac 2	16K Spec.	Calpac	Education	*
Calpac 3	16K Spec.	Calpac	Education	*
Calpac 1	16K ZX-81	Calpac	Education	*
Calpac 2	16K ZX-81	Calpac	Education	*
Castle Colditz	48K Spec.	Felix	Adven.	*
Castle Colditz	16K ZX-81	Felix	Adven.	*
Caterpillar	16K Spec.	CDS	Arcade	*
Character Gen	16K Spec.	Spectrasoft	Utility	*
Chequered Flag	48K Spec.	Sinclair	Arcade	8
Children's Compendium	16K Spec.	Dymond	Game	*
Chuckie Egg	16K Spec.	A and F	Arcade	*
Collector's Pack	48K Spec.	Sinclair	Business	7
Colossal Caves	48K Spec.	CP	Adven.	*
Compiler	48K Spec.	Softek	Utility	6
Composer	48K Spec.	Contrast	Utility	*
Conflict	48K Spec.	Martech	Strat.	*
Conflict	16K ZX-81	Martech	Strat.	7
Countabout	48K Spec.	Longman	Education	*
Countries of the World	16K Spec.	Hewson	Utility	8
Corridors/Genon	48K Spec.	New Gen.	Arcade	9
Cosmic Guerilla	16K Spec.	Crystal Comp	Arcade	8
Cosmos	16K Spec.	Abbex	Arcade	7
Copycat	1K ZX-81	Copycat	Utility	*
Counting	16K Spec.	Starter Soft	Education	*
Counting	16K Spec.	Widget	Education	*
Crevasse and Hotfoot	16K Spec.	Microsphere	Games	7
Critical Path Analysis	48K Spec.	Hilderbay	Business	*

Name	Machine	Company	Type	Gilbert factor
Critical Path Analysis	16K ZX-81	Hilderbay	Business	6
Cruising	16K Spec.	Sunshine	Arcade	4
Cyber Rats	16K Spec.	Silversoft	Arcade	7
Cycle Planner	16K Spec.	Medidata	Utility	4
Dallas	16K Spec.	CCS	Sim.	6
Dallas	16K ZX-81	CCS	Sim.	6
Demolition	16K ZX-81	Comp. Rntls.	Game	*
Derby Day	48K Spec.	Comp. Rntls.	Game	*
Destroyer	16K Spec.	Winters	Game	*
Devils of Deep	48K Spec.	Shephard	Adven.	*
Dictator	16K Spec.	Bug Byte	Strat.	*
Dietron	16K Spec.	Custom	Utility	6
Disassembler	16K Spec.	dK' Tronics	Utility	7
Display	16K Spec.	Work Force	Utility	*
DIY Book-keeping	48K Spec.	RAMTOP	Business	*
DLAN	48K Spec.	Campbell	Utility	*
Do Not Pass Go	48K Spec.	Work Force	Strat.	6
Do Not Pass Go	16K ZX-81	Work Force	Strat.	*
Door Slammer	16K ZX-81	Cathedral	Arcade	7
Draft	16K ZX-81	Myrmidon	Business	*
Draughts	48K Spec.	CP	Mind Game	*
Dungeons of Doom	16K ZX-81	Woosoft	Adven.	*
Dungeon Master	48K Spec.	Crystal Comp.	Adven.	8
Dymonoids	16K Spec.	Dymond	Game	*
Editor/Assembler	16K Spec.	Picturesque	Utility	8
Educational	16K Spec.	Startersoft	Education	*
Engine Diagnostic	48K Spec.	Spectrasoft	Utility	*
Escape	16K Spec.	New Generation	Maze	8
Espionage Isl.	48K Spec.	Artic	Adven.	5
Espionage Isl.	16K ZX-81	Artic	Adven.	*
Ext	48K Spec.	Abbex	Arcade	6
Everest Ascent	48K Spec.	Shepard	Adven.	6
Evolution	48K Spec.	Microsphere	Game	*
Family Games Pack	16K Spec.	Hornby	Game	*
Farmer	16K Spec.	CCS	Sim.	*
Farmer	16K ZX-81	CCS	Sim.	*
Fighter Pilot	16K ZX-81	Digital Int.	Sim.	5
Finance Manager	16K Spec.	OCP	Business	9
Firework Music	16K Spec.	Soft Cottage	Education	*
Flight Sim.	48K Spec.	Sinclair	Sim.	6
Flight Sim.	16K ZX-81	Sinclair	Sim.	6
Flippit	48K Spec.	Sinclair	Puzzle	7
Football	16K Spec.	Winters	Sim.	*
Football Manager	48K Spec.	Addictive Gms.	Sim.	7
Football Manager	16K ZX-81	Addictive Gms.	Sim.	*
Forth	48K Spec.	Abersoft	Language	9
Forth	48K Spec.	Sinclair	Language	7
Forth	16K ZX-81	Sinclair	Language	7
Four Rules of Number	16K Spec.	Micro Master	Education	*
Four Rules of Number	16K ZX-81	Micro Master	Education	*
FP Compiler	16/48 Spec.	Softek	Utility	9
French Voc Test	16K Spec.	Tutorial	Education	*
French Voc Test	48K Spec.	Tutorial	Education	*
Fruit Line	16K Spec.	P A Hanson	Game	*
Fruit Machine	16K Spec.	dK' Tronics	Game	6
Full-screen Breakout	1K ZX-81	New Generation	Arcade	*
Galaxians	16K Spec.	Artic	Arcade	6
Galaxy Conflict	48K Spec.	Martech	Strat.	*
Galaxy Conflict	16K Zx-81	Martech	Strat.	8
Gangsters	48K Spec.	P Boulton	Strat.	*

Name	Machine	Company	Type	Gilbert factor
Gambling Tape	16K Spec.	Dymond	Game	*
Games	16K ZX-81	P Teakle	Game	*
Games 2	16K ZX-81	JRS	Game	*
Games Tape 1	1K ZX-81	J K Greye	Game	*
Games Tape 2	16K ZX-81	J K Greye	Game	*
Games Tape 3	16K ZX-81	J K Greye	Game	*
Games Pack 1	16K Spec.	A Burnham	Game	*
Games Tape 1	16K Spec.	Sospan	Game	*
Games Tape 2	16K Spec.	Sospan	Game	*
Ghost Hunt	16K Spec.	PSS	Arcade	*
Gnasher	16K Spec.	R & R	Maze	8
Gobble-a-Ghost	16K Spec.	CDS	Arcade	*
Gobbleman	16K Spec.	Artic	Arcade	*
Gobbleman	16K Zx-81	Artic	Arcade	*
Gobbler	16K ZX-81	Software Farm	Arcade	*
Golden Apple	48K Spec.	Artic	Adven.	*
Golf	16K Spec.	R & R	Sim.	7
Golf	16K Spec.	Virgin	Sim.	8
Gorgon	48K Spec.	Phipps	Adven.	*
Gorilla	16K Spec.	D Hornsby	Game	*
Go To Jail	48K Spec.	Automata	Trad.	*
Grand Prix	16K ZX-81	dK' Tronics	Arcade	*
Graphics	16K ZX-81	IPA	Utility	*
Graphics Toolkit	16K ZX-81	JRS	Utility	9
Great Britain Ltd	48K Spec.	Hessel	Strat.	7
Great Britain Ltd	16K ZX-81	Hessel	Strat.	*
Greedy Gulch	16K ZX-81	Phipps	Adven.	7
Ground Attack	16K Spec.	Silversoft	Arcade	6
Ground Force Zero	16K Spec.	Titan	Arcade	*
Gulp 2	16K ZX-81	Campbell	Arcade	*
Gulpman	16K Spec.	Campbell	Arcade	*
Halls of Things	48K Spec.	Crystal Comp.	Adven.	9
Handwriting	48K Spec.	Chalksoft	Educ.	*
Hanoi King	48K Spec.	Contrast	Mind Game	*
Heathrow	16K Spec.	Hewson	Sim.	8
Hidden Letters	16K Spec.	Poppy	Education	*
High Noon	48K Spec.	Work Force	Arcade	9
High-resolution Invaders	16K ZX-81	Odyssey	Arcade	*
Hitch Hikers' Guide to the Galaxy	48K Spec.	ESP	Adven.	6
Hobbit	48K Spec.	Sin/M.Hse.	Adven.	9
Horace and the Spiders	16K Spec.	Sinclair	Arcade	8
Horace Goes Skiing	16K Spec.	Sinclair	Arcade	8
Hot Dot Spotter	16K Spec.	Longman	Education	*
Hungry Horace	16K Spec.	Sinclair	Arcade	8
Hunter Killer	48K Spec.	Protek	Sim.	*
I Ching	48K Spec.	Sirius	Game	*
Inca Curse	48K Spec.	Sinclair	Adven.	6
Inca Curse	16K ZX-81	Sinclair	Adven.	*
Inkos	48K Spec.	Chalksoft	Sim.	*
Integration	16K Spec.	University	Utility	8
Integration	16K ZX-81	University	Utility	8
Intermediate English 1	16K Spec.	Rose	Education	*
Intermediate English 1	16K ZX-81	Rose	Education	*
Intermediate English 2	16K Spec.	Rose	Education	*
Intermediate English 2	16K ZX-81	Rose	Education	*
Intermediate Maths 1	16K Spec.	Rose	Education	*
Intermediate Maths 1	16K ZX-81	Rose	Education	*
Intermediate Maths 2	16K Spec.	Rose	Education	*
Intermediate Maths 2	16K ZX-81	Rose	Education	*

Cassette Round-up

Name	Machine	Company	Type	Gilbert factor
Invaders	16K ZX-81	Abersoft	Arcade	*
Invaders	16K ZX-81	Bug Byte	Arcade	*
Invaders	16K ZX-81	Silversoft	Arcade	*
Invasion Force	16K Spec.	Artic	Arcade	8
Invincible Isl.	48K Spec.	Shephard	Adven.	8
Jackpot	48K Spec.	Comp. Rntls.	Arcade	*
Go To Jail	48K Spec.	Automata	Trad.	*
Johnny Reb	48K Spec.	Lothlorian	Sim.	*
Keysounder	16K Spec.	S and G	Utility	*
The Key	16K Spec.	Keysoft	Utility	*
Knight's Quest	48K Spec.	Phipps	Adven.	6
Knight's Quest	16K ZX-81	Phipps	Adven.	*
Krackit	16K Spec.	Artic	Adven.	4
Krackit	16K ZX-81	Artic	Adven.	4
Labyrinth	16K Spec.	Axis	Arcade	4
Language Devel. Series	16K Spec.	Glasson	Education	*
Language Devel. Series	16K ZX-81	Glasson	Education	*
Language Devel. Series	16K ZX-81	Micro Master	Education	*
Language Devel. Series	16K Spec.	Micro Master	Education	*
Lazatron	48K Spec.	Contrast	Arcade	*
Leap Frog	16K Spec.	CDS	Arcade	*
Learning Read 1	16K Spec.	Poppy	Education	*
Linear Progging	16K Spec.	University	Utility	*
Linear Progging	16K ZX-81	University	Utility	*
Lost Island	16K ZX-81	JRS	Adven.	*
Machine Code Test Tool	16K Spec.	OCP	Utility	7
Machine Code Test Tool	16K ZX-81	OCP	Utility	*
Mad Martha	48K Spec.	Miko-Gen	Adven.	7
Magic Mountain	16K ZX-81	Phipps	Adven.	*
Mailing List	16K ZX-81	Hestacrest	Business	*
Masterfile	48K Spec.	Campbell	Business	8
Masterfile 16	16K Spec.	Campbell	Business	*
Matcalc	16K Spec.	Work Force	Utility	*
Maths Tutor	16K Spec.	AD Software	Education	*
Matrix Operations	16K ZX-81	University	Utility	7
Matrix Operations	16K Spec.	University	Utility	7
Maze Chase	16K Spec.	Hewson	Arcade	8
Maze Death Race	48K Spec.	PSS	Arcade	*
Maze Death Race	16K ZX-81	PSS	Arcade	*
Maze Man	16K ZX-81	Abersoft	Arcade	*
Maziacs	48K Spec.	dK' Tronics	Arcade	8
Mazogs	16K ZX-81	Bug Byte	Arcade	*
MCoder	16K Spec.	PSS	Utility	*
MCoder	16K ZX-81	PSS	Utility	*
Melbourne Draw	48K Spec.	Melbourne Hse.	Utility	7
Merchant of Venus	16K ZX-81	Crystal	Adven.	7
Meteoroids	16K Spec.	dK' Tronics	Arcade	*
Meteoroids	16K Spec.	Softek	Arcade	6
Meteor Storm	16K Spec.	Quicksilva	Arcade	7
Micropen	16K Spec.	Contrast	Utility	*
Mined Out	16K Spec.	Quicksilva	Arcade	7
Mines of Saturn/ Return to Earth	16K Spec.	Mikro-Gen	Adven.	*
Money	16K Spec.	Poppy	Education	*
Monitor/Diss.	48K Spec.	Sinclair	Utility	8
Muncher	16K Spec.	Silversoft	Arcade	*
Muncher	16K ZX-81	Silversoft	Arcade	*
Namtir Raiders	16K ZX-81	Artic	Arcade	8
Night Gunner	16K ZX-81	Digital	Sim.	5
NightFlite	16K Spec.	Hewson	Sim.	5
Nowotnik Puzzle	16K Spec.	Phipps	Game	7
Nowotnik Puzzle	16K ZX-81	Phipps	Game	*

Name	Machine	Company	Type	Gilbert factor
Odds-on	16K Spec.	RSD	Game	*
O Level Chemistry	48K Spec.	Calpac	Education	*
O Level Chemistry	16K ZX-81	Calpac	Education	*
O Level Fench Revision	16K ZX-81	Rose	Education	*
O Level Maths Revision	16K ZX-81	Rose	Education	*
O Level Physics	16K Spec.	Homestudy	Education	*
O Level Physics	48K Spec.	Think Tank	Education	*
Omnicalc	48K Spec.	Microsphere	Business	9
Orbiter	16K Spec.	Silversoft	Arcade	7
Original Superchess	48K Spec.	CP Software	Tradtitional	*
Original Superchess	16K ZX-81	CP Software	Traditional	*
Ostron	16K Spec.	Softek	Arcade	*
Othello	16K Spec.	CP Software	Traditional	*
Othello	16K Spec.	M.O.I.	Traditional	*
Othello	16K ZX-81	M.O.I.	Traditional	*
Pathfinder	16K Spec.	Widget	Education	*
Payroll	48K Spec.	Hilderbay	Business	9
Payroll	16K ZX-81	Hilderbay	Business	*
Payroll	32K ZX-81	Soft Tech	Business	*
Payroll	48K ZX-81	Soft Tech	Business	*
Peek	16K Spec.	Zen	Utility	*
Penetrator	48K Spec.	Mel. Hse.	Arcade	7
Personal Banking System	48K Spec.	Hilton	Business	*
Personal Banking System	16K ZX-81	Hilton	Business	*
Pharoah's Tomb	16K ZX-81	Phipps	Adven.	*
Pilot	16K ZX-81	Hewson	Simulation	7
Pimania	16K ZX-81	Automata	Simulation	*
Pimania	48K Spec.	Automata	Simulation	7
Pinball	16K Spec.	Winters	Game	*
Pirate	48K Spec.	Chalksoft	Educ.	*
Pitman Seven	16K Spec.	Visions	Adven.	*
Planet of Death	16K Spec.	Artic	Adven.	6
Planetoids	16K Spec.	Sinclair	Arcade	8
Polynomials	16K Spec.	University	Utility	8
Polynomials	16K ZX-81	University	Utility	
Pool	16K Spec.	Bug Byte	Game	7
Pre/early school cassettes	16K Spec.	Essex	Education	*
Primary Arithmetic	16K Spec.	Rose	Education	*
Primary Arithmetic	16K ZX-81	Rose	Education	*
Print Shop	16K Spec.	CCS	Simulation	8
Print Shop	16K ZX-81	CCS	Simulation	*
Pro-Golf	16K Spec.	Hornby	Game	7
Programmer's Dream	16K Spec.	Work Force	Utility	8
Programme Enhancement Package	16K ZX-81	R and R	Utility	*
Puckman	16K ZX-81	Hewson	Arcade	*
Purchase Ledger	16K ZX-81	Hestacrest	Business	*
Quest	48K Spec.	Hewson	Adven.	6
Ramopoly	48K Spec.	J Fletcher	Game	*
Red Weed	48K Spec.	Lothlorian	Simulation	*
Regression	16K Spec.	University	Utility	8
Regression	16K ZX-81	University	Utility	*
Renumber Delete	16K Spec.	Work Force	Utility	*
Renumber Delete	16K ZX-81	Work Force	Utility	*
Rescue	48K Spec.	Computer Rent	Arcade	*
Reversi	16K Spec.	Sinclair	Traditional	8
Roulette	16K Spec.	Newsoft	Traditional	*
Roulette	48K Spec.	Dymond	Traditional	*
Sales Day Book	48K Spec.	Transform	Business	*
Sales Day Book	16K ZX-81	Transform	Business	*
Sales Ledger	16K ZX-81	Hestacrest	Business	*

Name	Machine	Company	Type	Gilbert factor
Secret Valley	16K Spec.	Newsoft	Adven.	*
Secret Valley	16K ZX-81	Newsoft	Adven.	*
Self-teach Program	16K Spec.	Anvil	Education	*
Self-teach Program	16K ZX-81	Anvil	Education	*
Sentinel	16K Spec.	Abacus	Arcade	*
Serpents Tomb	16K ZX-81	Vortex	Adven.	*
The Settler	16K Spec.	BSS	Utility	*
The Settler	16K ZX-81	BSS	Utility	*
Shape Sorter	16K Spec.	Widget	Education	*
Sideways Copy	16K ZX-81	D King	Utility	*
Sheepwalk	48K Spec.	Virgin	Game	7
Sheer Panic	16K Spec.	Visions	Arcade	7
Ship of Doom	48K Spec.	Artic	Adven.	7
Shiva Special 1	16K Spec.	Shiva	Games	*
Shopping List	16K Spec.	SD	Utility	*
Sky Raider	16K Spec.	C M Smith	Arcade	*
Slippery Sid	16K Spec.	Silversoft	Arcade	8
Slow Loader	16K Spec.	ELR	Utility	9
Snail Logo	48K Spec.	CP	Language	*
Snail Logo	48K Spec.	CP	Educ/Lang.	7
Snooker	16K Spec.	Visions	Arcade	*
Softalk 1	48K Spec.	CP	Utility	*
Softalk 2	48K Spec.	CP	Utility	*
Solaris	48K Spec.	Sotel	Arcade	*
Solo Whist	16K Spec.	Video Soft.	Traditional	*
Sound FX	16K Spec.	dK' Tronics	Utility	6
Space Fighter	16K Spec.	Winters	Arcade	*
Space Intruders	16K Spec.	QS	Arcade	7
Space Lanes	16K Spec.	Cathedral	Arcade	*
Space Raiders	16K Spec.	Sinclair	Arcade	6
Space Raiders	16K ZX-81	Sinclair	Arcade	*
Space Trek	16K ZX-81	JRS	Arcade	*
Space Zombies	16K Spec.	Mikro-Gen	Arcade	*
Spanish Gold	48K Spec.	Chalksoft	Education	*
Speak and Spell	48K Spec.	S and G	Education	*
Spec. Assembler	48K Spec.	Artic	Utility	*
Spec. Bug	16K Spec.	Artic	Utility	*
Spec. Tape Copier	16K Spec.	S Giza	Utility	*
Spectadraw 2	48K Spec.	McAlley	Utility	*
Spectipede	16K Spec.	R and R	Arcade	8
Spectral Panic	16K Spec.	Hewson	Arcade	5
Spec. Compiler	48k Spec.	Softek	Utility	7
Spec. Editor/ Assembler	16K Spec.	Picturesque	Utility	8
Spec. Forth	48K Spec.	Abersoft	Language	9
Spec. Forth	48K Spec.	CP	Utililty	*
Spec. Frogs/ Showdown	16K Spec.	Artic	Arcade	*
Spec. Gobbleman	16K Spec.		Arcade	*
Spec. Invaders	16K Spec.	Artic	Arcade	*
Spec. Invasion Force	16K Spec.	Artic	Arcade	*
Spec. Microchess	16K Spec.	Artic	Traditional	*
Spec. Monitor	16K Spec.	Picturesque	Utility	8
Spec. Scramble	16K Spec.	Work Force	Arcade	7
Spec. Sound	16K Spec.	M Afzal	Utility	*
Spellbin	16K Spec.	Startersoft	Education	*
Splat	48K Spec.	Incentive	Arcade	8
Spookyman	16K Spec.	Abbex	Arcade	7
Star Gazer	48K Spec.	CRL	Utility	8
Superchess II	48K Spec.	CP	Traditional	8
Supercode	16/48K Spec.	CP	Utility	*
Super Play I	16K Spec.	Video	Games	*
Superspy	48K Spec.	Shepherd	Adven.	5
Tai	16K ZX-81	PSS	Game	*
Tank Battle	16K Spec.	dK' Tronics	Game	8
Tape Breaker	16K Spec.	Spectrasoft	Utility	*
Tasword	48K Spec.	Tasman	Business	8
Tasworld II	48K Spec.	Tasman	Business	9
Teacheraid	16K Spec.	B Farris	Education	*
Teach Data	48K Spec.	B Farris	Education	*
Teacher Data	48K Spec.	Farris	Utility	7

Name	Machine	Company	Type	Gilbert factor
Tennis	16K Spec.	Winters	Game	*
Tenpin	16K ZX-81	Phipps	Game	*
Test Match	48K Spec.	Computer Ren.	Game	*
The Orb	48K Spec.	Computer Ren.	Adven.	*
The Castle	48K Spec.	Bug Byte	Adven.	*
The Forest	48K Spec.	Phipps	Sim.	*
The Great Western	16K Spec.	New Soft	Game	*
The Great Western	16K ZX-81	New Soft	Game	*
The Pyramid	48K Spec.	Fantasy	Arcade	7
Time Bandits	16K Spec.	New Soft	Adven.	*
Time Bandits	16K ZX-81	New Soft	Adven.	*
Time Gate	48K Spec.	QS	Arcade	8
Tomb of Dracula	48K Spec.	Felix	Adven.	*
Tomb of Dracula	16K ZX-81	Felix	Adven.	*
Trace	16K Spec.	Zen	Utility	*
Trace	16K Spec.	Texgate	Utility	8
Train Game	48K Spec.	Microsphere	Game	9
Transylvanian Tower	48K Spec.	Shepherd	Adven.	*
Troon	48K Spec.	Hornby	Game	8
Tube Train Terror	48K Spec.	JRS	Game	*
3D Tunnel	48K Spec.	New Gen.	Arcade	9
The Turk	48K Spec.	OCP	Traditional	8
Valhalla	48K Spec.	Movisoft	Adven.	*
Velnor's Lair	48K Spec.	QS	Adven.	8
Voice Chess	48K Spec.	Artic	Traditional	9
Volcanic Dungeon	16K ZX-81	Carnell	Adven.	*
Volcanic Dungeon	48K Spec.	Carnell	Adven.	6
Vu-Calc	16K Spec.	Sinclair	Business	7
Vu-File	16K Spec.	Sinclair	Business	8
Vu3D	48K Spec.	Sinclair	Utility	8
Warlord	48K Spec.	Lothlorian	Simulation	*
Wizard's Warriors	16K Spec.	Abersoft	Arcade	*
Word Fit	16K ZX-81	Ram Writer	Game	6
World Info	48K Spec.	Wimsoft	Utility	*
Wrath of Magra	48K Spec.	Carnell	Adven.	*
X Ray	16K Spec.	Zen	Utility	*
Yahtzi	48K Spec.	Work Force	Traditional	*
Yomp	16K Spec.	Virgin	Arcade	7
Zeus Assembler	48K Spec.	Sinclair	Utility	9
Zodiac I	16K ZX-81	Stellar	Utility	*
Zodiac II	16K ZX-81	Stellar	Utility	*
Zodiac F	48K Spec.	Stellar	Utility	7
ZXAS	16K ZX-81	Bug Byte	Utility	*
ZX-Bug	16K ZX-81	Artic	Utility	*
ZX-Chess I	16K ZX-81	Artic	Traditional	*
ZX-Chess II	48K Spec.	Artic	Traditional	*
ZX 1K Chess	1K ZX-81	Artic	Traditional	*
ZX Compiler	16K ZX-81	Silversoft	Utility	*
ZXDB	16K ZX-81	Bug Byte	Utility	*
ZX Draughts	48K Spec.	CP	Traditional	*
ZXED	16K Spec.	dK' Tronics	Utility	*
ZX Forth	16K ZX-81	Artic	Language	8
ZX Forth	48K Spec.	Artic	Language	8
ZX-81 1K Games Pack	1K ZXZ-81	Crystal	Games	9
ZX Invasion Force	16K ZX-81	Artic	Arcadé	*
ZX-81 Pocket Book	16K ZX-81	Phipps	Games	*
ZX-81 Remload	16K-64K ZX-81	Picturesque	Utility	*
ZX Screenkit	4K-64K ZX-81	Picturesque	Utility	*
ZX-sideprint	16K ZX-81	Microsphere	Utility	*


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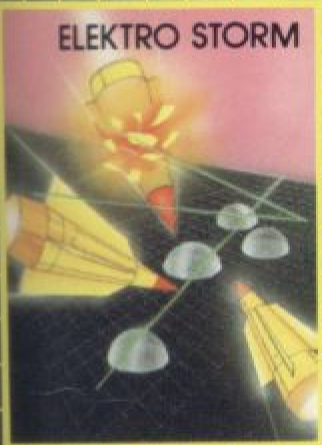
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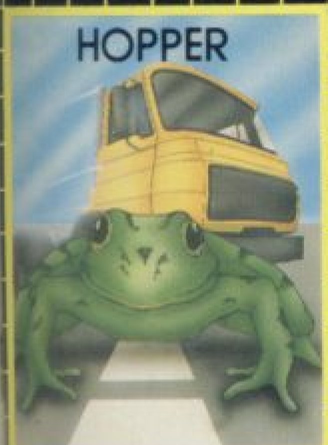
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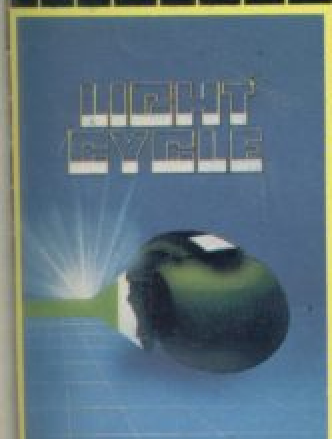
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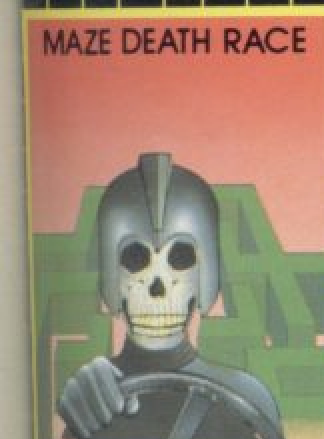
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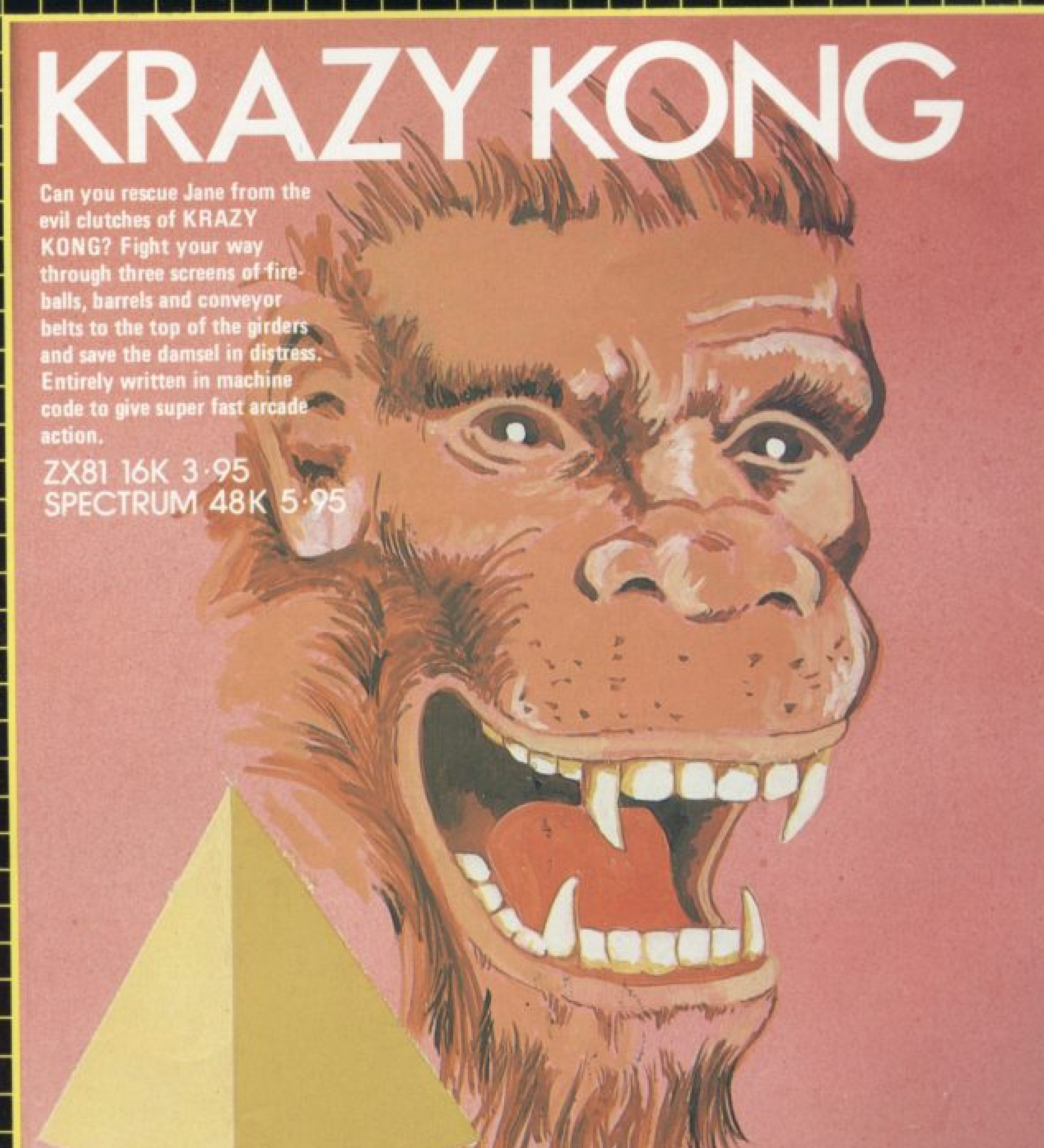


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